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# DEFENSE INDUSTRY BULLETIN

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# DEFENSE INDUSTRY BULLETIN

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Suggestions from industry representatives concerning possible topics for future issues are welcomed and should be forwarded to the Editor at the address shown below.

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Logistic support and services for the Armed Forces are the Defense Supply Agency missions. A series of articles on the material supply and logistics organizations of the Military Departments begins with the DSA article on page 12.

# The Role of "Need-To-Know" in Releasing Classified Information

**C. Donald Garrett**

The "need-to-know" principle is a vital part of the Government's security of information program. The necessity for ensuring the free interchange of classified scientific and technical information throughout the scientific and technical community raises continuing problems and unique need-to-know situations. It is the purpose of this article to discuss the various aspects of the principle and to suggest some of the considerations involved.

Section 7, Executive Order 10501, Nov. 5, 1953, states in pertinent part:

> **Knowledge or possession of classified defense information shall be permitted only to persons whose official duties require such access in the interest of promoting national defense and only if they have been determined to be trustworthy.**

This establishes the basis for the need-to-know concept.

The Defense Department, in Subsection VII.D, Enclosure 1 to DOD Directive 5200.1, "Safeguarding Official Information in the Interests of the Defense of the United States," July 10, 1968, states it this way:

> **The dissemination of classified information orally, in writing, or by any other means, shall be limited to those persons whose official duties require knowledge or possession thereof.**

This is need-to-know.

Subsection VII.D states further:

> **The final responsibility for determining whether a person's official duties require that he possess or have access to any element or item of classified information, . . . rests upon each individual who has authorized possession, knowledge, or control of the information involved and not upon the prospective recipient.**

This shows clearly that the responsibility of determining need-to-know rests solely with the person who has the classified information. The prospective recipient may be called upon to show the nature of his need, but the holder decides whether the need is sufficient to permit release of the classified information.

There are certain overall restrictions on releases, even though the holder recognizes an established need-to-know.

- **Security clearance.** Before classified information is released, the recipient must be known to have been cleared under procedures, policies and standards relating to trustworthiness established by the Government.
- **Third-agency rule.** Information that does not belong to the holder (information that is under the classification jurisdiction of another government agency) can be released to a third party (someone outside both agencies involved) only with the consent of the "owner" of the classified information. In this connection the entire Defense Department is one agency and the third-agency rule does not apply within DOD, except when the "owner" of the classified information specifically restricts release within his DOD component (Military Department or Defense Agency).
- **Statutory limitations.** Proprietary rights and trade secrets are protected by law, and releases of classified information cannot be made in violation of those rights. Congress has specifically limited the release of Restricted Data and Formerly Restricted Data (certain atomic and nuclear information). The munitions control laws limit releases of certain information, classified and unclassified, to certain foreign countries.
- **Foreign releases.** No classified information may be released to *any* foreign national unless there is specific authority covering the release. The National Disclosure Policy covering foreign releases provides standards, procedures and authorities for release of certain classified information to certain foreign countries and nationals.
- **Especially sensitive information.** Certain categories of information of a highly sensitive nature are subject to restrictions on release to identified recipients. In other words, the gen-

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eral need-to-know limits are defined, *e.g.*, cryptographic information, certain intelligence, and other special access categories of information. In some of these areas, the need-to-know restrictions are established by agencies outside DOD.

Subsection VII.D., DOD Directive 5200.1, continues:

> **These principles are equally applicable if the prospective recipient is an organizational entity, including commands, other Federal agencies, defense contractors, and foreign governments.**

In many cases the need-to-know determination is based upon the needs of an organization. In these cases, the person who will actually receive the classified information may not be known or ascertainable to the holder, the releaser. The original releaser's need-to-know responsibilities would be satisfied when he establishes the organization's need for the information. It is necessary to assume that the internal structure and procedures of the receiving organization will ensure release to the individuals in the organization who have the requisite need-to-know.

### What Are "Official Duties?"

The need-to-know concept is related directly to the interests of national defense by Executive Order 10501. As in the case of deciding how to define "the interests of national defense" for security classification purposes, for need-to-know purposes the term is construed on a very broad base to include practically any governmental activity that affects or relates to:

- The capability of the United States to defend itself.
- Any national defense advantage (strategic, tactical, technological, scientific, logistical, and even economic or political as it might affect U.S. domestic or international relationships) the United States has over other nations.
- The international posture of the United States and our relations with foreign nations.

In one way or another, practically every agency in the Executive Branch particpates at some time in activities affecting or relating to national defense. Members of Congress and Congressional committees, including their staffs, certainly become involved in national defense matters. The Federal judiciary considers cases in which national defense interests are involved.

It is fair to say, therefore, that any employee or official of the Federal Government, at one time or another, may become involved in activities affecting or relating to the interests of national defense. The mere fact of official connection with the Government, however, does not establish a need-to-know for access to classified information. It is necessary that one's connection with the Government place him in such a position that, in order to carry out his responsibilities to his employer (the Government), he must have access to certain classified information.

In many instances the level of an individual's connection with the Government makes it necessary for him to have rather broad access so as to enable him to keep abreast of developments, activities, or operations in which his governmental organization is involved. This kind of need must not be confused with a "nice-to-know" or a "nice-to-see" desire.

Here again, the mere fact of a high-level connection with a government office provides no basis for having access to classified information. There must be some reasonable connection between:

- The functions, purposes, or activities of the government organization involved.
- The individual's duties in that organization.
- The classified information or, at the least, the individual must be involved officially in some government activity relating to national defense, that makes access to the classified information essential to participation in that activity.

At the lower levels in government organizations, the need-to-know becomes more closely and necessarily connected with the duties each individual has and must perform in order to carry on the government business. In many cases the need is relegated to a mere "need-to-have" or a "need-to-handle," without need-to-know the substance of the classified information, *e.g.*, mail or equipment handlers and processors. It is always necessary to consider protection of classified information so that the substance of the classified information is not available to everyone who must handle classified material. Sometimes the nature of the material is such that anyone who handles it will have access to the classified information contained in the material. This becomes important when the nature of the classified information is such that the material must be wrapped or packaged, so as to preclude access by mere handlers who have no need-to-know the substance of the classified information.

In some few cases, the party who desires the information may be in a position in which it is difficult to see a need-to-know. The circumstances may be such as to render it imprudent or even unproductive to inquire further into the reasons why access is desired. In such cases, either the holder recognizes that the party concerned has governmental connections or duties to which the classified information is reasonably, even though remotely, connected, or he decides to refer the matter to some higher echelon for resolution.

### Private Enterprise

When the prospective recipient is outside the Federal Government, there must be a close relationship between the classified information and the duties, functions, activities, or operations of the recipient. Basically, access must be related to accomplishment of a government purpose related to national defense.

For contractors, who are performing or have been asked to perform under a DOD contract, the need-to-know is established by the subject matter of the contract. When a contractor is working under a contract with one government agency, there may be a reasonable need-to-know for classified information belonging to another activity within *that* Government agency. In this sense, the entire Defense Department is one government agency, and the needs of national defense demand a free flow of information between all elements of the department and the contractors thereof. There should be a minimum of question on need-to-know when it is shown or known that there is a direct or reasonable connection between the classified information and the subject matter of a contract, or the activities or functions of the contractor in relation to government business.

In many fields of interest, a general need-to-know exists among all or many participants in that field of interest. To facilitate military developments, to conserve resources, to make maximum use of available expertise, to eliminate wasteful duplication and to reduce costs, it becomes important to ensure a free flow of scientific and technical information among the community involved in a particular field of interest. Any contractor working on a government contract in that field of interest may well have a reasonable need for all available information to assist in performance under the contract.

Private facilities which do not have current contracts should be considered to have a legitimate need-to-know for classified information. The information is needed to maintain their capabilities as developers and producers of future equipments or advanced generations of existing equipments. Further, classified information may be needed to enable them to contribute their expertise in the search for new and better military equipment. In all these cases, however, the nature of the contribution the private facilities can make to national defense must be more than theoretical, it must be actual and demonstrable, although not necessarily immediate.

### Who Has a Need-to-Know?

Within a DOD activity the commander or top supervisor is responsible for ensuring application of established need-to-know principles. As a practical matter, unless there is a particular reason for very tight need-to-know controls, once an organizational entity or anyone within an organization is determined to have a legitimate need-to-know, all of the principals and most of the hired hands in the organization would be considered to have requisite need-to know. An organizational head must be free to select those of his people who are to work on a particular subject at a particular time. For necessary flexibility, therefore, more than one person in the organization will need to have access to classified information that comes into the organization. In the sense used here, the "organization" should be the smallest unit involved in a particular line of work, such as a section or branch. Need-to-know in echelons above that organization should limit need-to-know to only those persons who supervise the organization, or engage in the same line of work with the organization.

The foregoing does not mean that *all* persons in an organizational entity are entitled to have access to *all* classified information that comes into the organization. Even in small organizations, only those person who need the information to carry out their official duties should have access to it. This would include, of course, as a general rule, the chief of the organization, one or more of his professional staff, and one or more of the clerical help.

A person may have more than one personal status, *vis-a-vis* classified information. For example, he may be a DOD or a DOD contractor employee, and also a military reservist. He also is a private citizen. As an employee, he may have need-to-know to certain information to which he would have no need-to-know as a military reservist and, certainly, no need-to-know as a private citizen. When he has a need-to-know and obtains access to certain classified information, he is, of course, privy to the information as an individual. His use of the information, however, is restricted to his capacity in the status in which he received it. He is privileged to pass the information on to properly cleared persons who have a need-to-know in relation primarily to the status in which he received it. He could, of course, pass it on to *proper* parties in relation to his other official government status but, as a private citizen, he is *not* privileged to use the classified information for his own benefit or to pass it on to anyone.

The "government purpose," for which access to classified information is claimed to be necessary, should be related in some way to the interests of national defense. The needs of the Government are so broad, however, that this connection often may be somewhat remote. It is axiomatic that the strength of the U.S. Government and the nation in all fields is related to its strength in the international arena; therefore, all activities affecting the strength of the Government and the nation affect the interests of national defense. For example, it would be appropriate to release classified information or equipment to a non-defense government department for the purpose of determining the usefulness of a piece of classified equipment for meeting the needs of the requesting department. It would also be appropriate to authorize release of classified information in a court case in which DOD or the Government is not a party, but only if it is first established that the interests of national defense would thereby be served.

In summary, "need-to-know" is a vital concept, and strict application of it to *every* release of classified information is absolutely essential. Arbitrary actions and parochial views, which result in denials of classified information to parties who have established a reasonable need, are wasteful and dangerous. It all cases, a reasonable approach, leaning to approval in doubtful cases, is necessary to facilitate the Governments business and the general national interest in maintaining a viable, progressive national defense posture.

## Research Sub To Conduct Gulf Stream Study

The world's largest non-military research submersible, Ben Franklin, will begin a month-long experimental cruise early in 1969 travelling along the Gulf Stream, from the tip of Florida to a point off the Massachusetts coast.

Equipped and supported by the U.S. Naval Oceanographic Office, scientists will monitor the craft's sensor systems during the undersea voyage.

The experiment also calls for photographing of the sea floor and its environment by a complex system of camera, sonar and closed circuit television equipment as the submersible is propelled northward by the current.

Included on the craft will be sensing devices designed to measure temperature, salinity, depth and pressure of water, irregularities in magnetic field, light absorption of water, and the turbulence where two opposing currents meet.

The Ben Franklin is owned and operated by the Grumman Aircraft Engineering Corp. but most of its equipment was provided by the Naval Oceanographic Office.

Although the deep diving vehicle is equipped with four 25-horsepower AC electric motors, the submersible was designed to be propelled northward along the Gulf Stream by the current itself providing a noiseless environment for research and observation.

# Army Moves to "Design for Support" Attitude

**Ralph F. Thompson**

The Army has moved from a solely "support the design" posture to include a "design for support" attitude in approaching the problem of establishing viable integrated logistic support (ILS). Under the new concept, functional activities and operational elements are coordinated under a four-pronged, disciplined management system. This total management system comprises a planning system, a series of procedural models, a data system, and a contract specification manual.

Progress toward this altered approach has been slow but consistent. The Army had considerable experience in the application of ILS principles even before DOD Directive 4100.35, "Development of Integrated Logistic Support for Systems and Equipments," was issued. A trial implementation on the M561 Truck (Gama Goat) of the Early Support Implementation Plan, prepared by the National Security Industrial Association (NSIA), contributed extensively to our background of practical experience. As a direct result of this experience on the Gama Goat, we very early became convinced that an adequate specification was required to establish necessary communication between the Army and the contractor. Much effort has been directed toward development of this specification. Also as a result of experience with the Gama Goat, we learned that the ILS "logistician" should participate in the "sign off" approving engineering changes to the system.

Rather than undertake a sequential description of progress, this article will discuss the Army's approach to integrated logistic support within each of the following areas:

- Organization.
- Personnel.
- Policies and procedures.
- Support Management.
- Specifications.
- Maintenance documentation and analysis.
- Test and demonstration.

## Organization

The Army has followed the evolutionary approach to its organization for the planning of ILS. In the Department of the Army staff, the obvious element responsible for ILS is the Deputy Chief of Staff for Logistics (DCSLOG). Accordingly, Army policies and responsibilities for ILS are established by DCSLOG. Responsibilities for management are assigned by Army Regulation 750–6, "Maintenance Support Planning," to each of the major Army field commands. These commands include, primarily, the U.S. Army Materiel Command, The Surgeon General, the U.S. Army Strategic Communications Command, and the U.S. Army Security Agency. Using the Army Materiel Command (AMC) as typical, Figure 1 shows the command organization. The ILS support planning function is assigned to the AMC Director of Maintenance and, in turn, to the Support Division within the Directorate. Other organizational elements shown on the chart also participate in ILS activities.

While this organization appears to be satisfactory, there can be little doubt, from current experience, that improvements in staffing and procedures are needed. Here, again, the evolutionary approach will be used to orient methods and procedures to achieve the long-range objectives of ILS. The Army has always recognized that design decisions may have a major affect on logistic requirements. To obtain simultaneous consideration of both support requirements and design decisions, the Army expects to establish concepts and characteristics

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which, when sufficiently defined, will exert a design influence favorable to the logistic requirements. Furthermore, we are progressively achieving better recognition of the relationships of each functional organization responsible for an element or aspect of logistic support. As these relationships become better defined, a better balance between them can be achieved.

Finally, this same organization extends downward to the national maintenance points at AMC commodity commands. These national maintenance points provide top level management of ILS planning for materiel within their command, and are identified as the logisticians who perform in accordance with the requirements of DOD Directive 4100.35.

## Personnel

Like any other activity, ILS depends upon people to achieve its objectives. The selection, assignment, training or orientation, and the motivation of the logisticians throughout the Army structure will continue to require serious consideration in the future.

Fortunately, the Army has a training course already in being. The Maintainability Engineering Intern Training Program at the Logistics Intern Training Center, Red River Army Depot, Texarkana, Tex., was established to train graduate engineers in maintainability. These engineers are well qualified to assist in establishing logistic requirements to influence design in favor of maintainability and reliability. Recent study also indicates that this maintainability training program can be condensed and used to provide ILS training at the undergraduate level to the logisticians at our national maintenance points. We expect to combine our limited number of maintainability engineers with the larger number of other (technical) logisticians to obtain effective ILS planning teams.

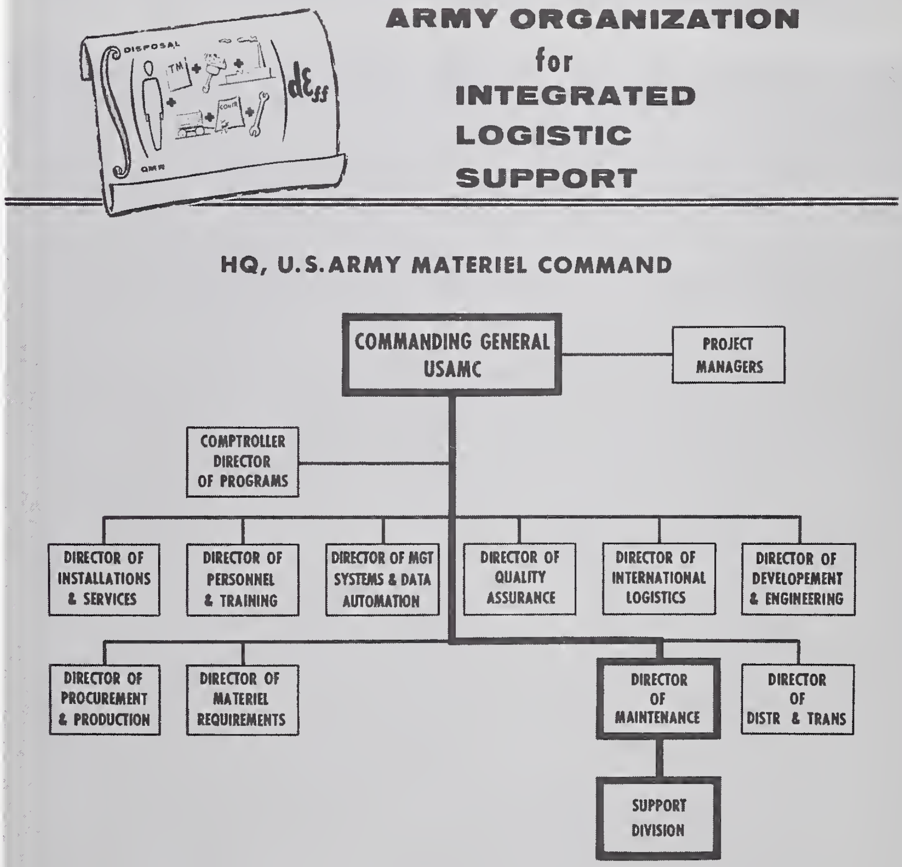
Having recognized the engineering and technical skills required, let us see what further knowledge is expected of the Army logistician in ILS. He has responsibility for administrative duties such as planning and management of the ILS effort. He is responsible for the support planning for a weapon system. He must understand and be able to contribute significantly to the weapon system program during each of its life-cycle phases, beginning with the concept phase and continuing through contract definition and development. To be effective, he must also understand the procedures and problems characteristic of support in the operational phase. These realities of operations are not readily learned from the textbook or in the office. In addition, he needs an intimate knowledge of the missions and functions of each of the separate logistic element managers within his organization.

The Army has recognized the need to acquire these experienced people with the necessary administrative and technical skills. To meet this need, training courses in maintenance management, logistic management, and project management are being expanded and updated.

## Policy and Procedures

ILS policies and procedures are contained in a variety of Army regulations and implementing directives under the umbrella of Army Regulation 750–6. This regulation has recently been changed as a result of logistic studies directed toward improvement of the Army support planning system.

Each major Army field command, such as the Army Materiel Command, has adapted Army Regulation 750–6 for its own use. In addition, a proposed management system is being prepared for publication in a series of Department of the Army technical manuals, which will provide guidance to the logistician with respect to both procedures and techniques for implementing ILS. The purpose and scope of these manuals are broad. Included are a management manual, a support


ARMY ORGANIZATION for INTEGRATED LOGISTIC SUPPORT
DISPOSAL
TM
HQ, U.S. ARMY MATERIEL COMMAND
COMMANDING GENERAL USAMC
PROJECT MANAGERS
COMPTROLLER DIRECTOR OF PROGRAMS
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DIRECTOR OF INTERNATIONAL LOGISTICS
DIRECTOR OF DEVELOPEMENT & ENGINEERING
DIRECTOR OF PROCUREMENT & PRODUCTION
DIRECTOR OF MATERIEL REQUIREMENTS
DIRECTOR OF MAINTENANCE
DIRECTOR OF DISTR & TRANS
SUPPORT DIVISION

Figure 1.

integration manual, a procedural guide, a maintenance engineering analysis data manual, and a contractual procedures manual. These manuals provide guidance for the development, acquisition, and use of total support for a system throughout its life cycle.

### Support Management

Support management of ILS in the Army is performed through the ILS plan, including its elements. This document is a principal supporting plan to the project manager's master plan. In turn, the elements forming the composite ILS plan serve to integrate, coordinate and schedule progress among the various logistic management elements such as funding, acquisition, planning, distribution, training, data accumulation, and transportation.

### Specifications

As mentioned earlier, the Army studied various approaches to contractual specification for ILS. Review and comments from industry were solicited in two earlier approaches. Although it is not feasible to attempt a specification which could be used without modification on all systems in all commodity areas, it is expected that the proposed Army specification will enable satisfactory communication with the contractor beginning with the request for proposal (RFP). Essentially, this specification calls for the contractor to submit his recommended program for implementing ILS with certain Army input and controls.

As the Army specification moves into its first series of contract applications, its impact will be evaluated and necessary revisions will be made. We estimate that it will be at least two, possibly three, years before the specification package will be completed and proven by contract negotiations.

ILS must be the product of a systems approach to support planning. There are no other choices of approach when one considers the interdependencies that exist between elements of the support system. It is not difficult to visualize the impact that total absence of repair parts, equipment publications, support equipment, or skilled personnel would have on materiel readiness in the field. It is, however, less obvious, but nonetheless true, that actions and decisions related to *development* of these elements are mutually supporting and interdependent.

Inherent in the systems approach is the requirement for complete, accurate and timely data. The cost of collecting, analyzing and retrieving data, and the volume of space required to store this data are recognized as major problems associated with the development and acquisition of modern materiel and support systems.

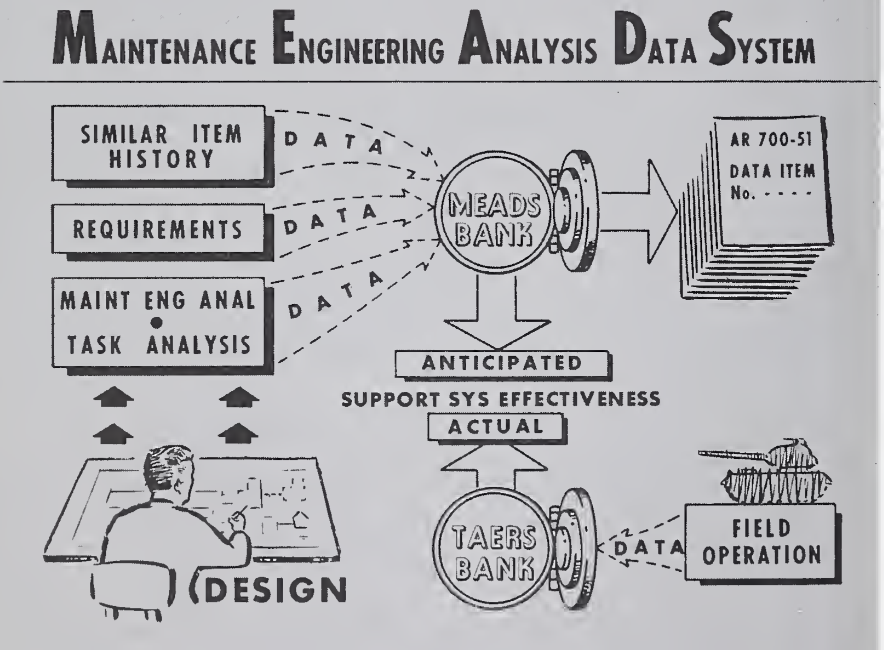
MAINTENANCE ENGINEERING ANALYSIS DATA SYSTEM
SIMILAR ITEM HISTORY
DATA
REQUIREMENTS
DATA
MAINT ENG ANAL • TASK ANALYSIS
DATA
MEADS BANK
AR 700-51 DATA ITEM No. - - - -
ANTICIPATED
SUPPORT SYS EFFECTIVENESS
ACTUAL
TAERS BANK
DATA
FIELD OPERATION
DESIGN

Figure 2.

### Maintenance Documentation and Analysis

As an answer to these problems, the Army is establishing a Maintenance Engineering Analysis Data System (MEADS) (Figure 2). This system will be automated when and to the degree feasible to obtain optimal integration of maintenance engineering and analysis data.

Data required for life-cycle costing; budget purposes; evaluation of support alternatives; reliability and maintainability apportionment and assessment; task, skill and manpower analysis; initial provisioning; equipment publications; or many other support-related purposes must be obtained during the development and production phases in progressing degrees of detail. Data to satisfy these support planning requirements are interrelated and interdependent, and any attempt to collect, store and analyze them separately and independently results in unnecessary delays and costs. For example, life-cycle costing data, while intended primarily for procurement purposes, constitute a valuable input to the evaluation of maintenance support alternatives. Similarly, initial provisioning data and source data for equipment publications are both traceable to data derived from the task, skill and manpower analyses.

The MEAD System is initiated early in the development life of new weapon systems and equipment and extends through production and early operation. It will be capable of accepting data on fielded equipment from The Army Equipment Records System (TAERS) for comparison with developmental data and for maintenance engineering analysis purposes. As development progresses, continuing maintenance analysis of the design drawings, and/or prototype hardware or mock-ups, provides progressively more detailed data. The documentation is provided for each subsystem and maintainable component or assembly. The breakdown of data as it relates to functional components, *i.e.*, engine, hydraulic system, armament system, etc., permits analysis and evaluation of each of these systems individually as well as in relation to total weapon system performance.

The framework for documenting MEADS data consists of 10 worksheets. The first four are input sheets and consist of:

- An item maintenance summary sheet completed for the end item or materiel system, and for each level of the system breakdown for which maintenance requirements have been established.
- An item maintenance support plan completed for each repairable item on the system.
- A maintenance analysis summary, also completed for each repairable item in the system.
- A maintenance task analysis sheet which is completed for each maintenance task associated with each repairable item.

The remaining worksheets summarize the information for analysis purposes, and are derived from the data on the four input sheets. These sheets provide summaries of support equipment, training aids and devices, spares and repair parts, personnel and training, technical data and information, and special facilities.

The MEAD System is an important key to the attainment of effective integrated support planning. It lends itself to the systems approach for support development by keeping the interrelationship of the support elements and the end item visible through a central data system. Such a system should provide a cost advantage over piecemeal acquisition of support related data.

Another facet of the systems engineering approach involves the need to effect meaningful design and logistic tradeoff actions. The systems approach inherent in ILS offers the opportunity for the designer and the ILS logistician to work together in seeking that approach to total system design which will result in optimum performance. It is through the injection of logistic consideration into design tradeoffs that this alliance has its most beneficial impact.

**GAMMA GOAT vehicle crosses difficult terrain. Army's integrated logistic support plan was first used on this vehicle.**

Perhaps the physical teardown, allocation and evaluation review is a unique facet of ILS in the Army. It is normally not combined with other formal Army reviews. The purpose of this nondestructive review is to accomplish a maintenance analysis and evaluation of the end item from a maintainability standpoint, to prepare and offer meaningful recommendations for design changes, and to evaluate the effectiveness of the necessary maintenance tools. This review is sponsored by AMC in coordination with the Army Combat Developments Command and the Continental Army Command. When incorporated in the contract, it becomes similar to a contractor demonstration of the system hardware and data. A coordinated maintenance allocation chart resulting from this review provides firm direction for further development of the maintenance test package, required to accompany the end item hardware provided for engineering tests and, subsequently, for service tests.

### Test and Demonstration

The Army considers that its series of acceptance tests, performed by an independent test agency, provide for satisfactory test and demonstration of the logistic support package. While the maintenance evaluation portion of these tests still requires improvement to test an entire package, increasing emphasis will be placed on this aspect in the future. Improved methods for stating, testing and demonstrating achievements against incentive clauses are also being developed.

The Army believes that ILS is applicable to almost all systems and equipment acquisitions. ILS in the Army is being formulated for the most complex systems, with provision for tailoring requirements to less complex equipment. We have come a long way in the last four years. As we become progressively more involved in Army-industry communications regarding ILS, we hope and expect to acquire even better methods for implementing it.

# Defense Contracting— The Problem of Distribution of Risk

*Speech by Lt. Gen. Charles H. Terhune Jr., USAF, Vice Commander, Air Force Systems Command, at the 1968 Western Briefing Conference on Government Contracts, San Francisco, Calif.*

Lt. Gen. Charles H. Terhune, USAF

It is a great pleasure to be here today and to have the opportunity to talk to you and participate with you in a discussion of "contracting" and "distribution of risk," a subject in which I am sure you are all very interested. In fact, this discussion, I am sure (before it is over) will resemble the description of the elephant by the five blind men—and I believe most of it will be based on honest differences of opinion or motivations.

I am not a lawyer. I cannot share your most professional discussions, but I am vitally interested in the successful development of weapon systems for the Air Force at maximum performance on a specific schedule—for a specific price. I am sure all of you want the same things for the country; but, you have one or more added incentives: a reasonable profit and a good reputation to name two that enter my mind without much prompting. So, while we have the same objectives, we diverge a little on some of our motivations, and accommodating these differences really highlights the basic problem we face in defining mutually acceptable contracts and risks.

### Development Risks

I conclude, after looking at the risks of development planning, management approaches, contract definition, systems responsibility, and total package procurement, that the fundamental risk for both industry and the Government is technical risk associated with financial or cost risk. For the contractor, the concern is that the job will be more difficult than anticipated, probably in unexpected areas and, therefore, the cost will be higher and the profit lower—or that there may even be a loss. For the Government, the fear is that the performance will be short, the schedule too long, or the cost will be overrun unacceptably. Alignment of interests in some fashion is imperative to at least minimize differences in motivation between customer and supplier.

I can recall only one risk-proof situation. St. Peter became exasperated with the devil, one day, over some cost figures and threatened to sue. The devil merely laughed at St. Peter's threat—he was not exposed to risk—he knew there were no lawyers in heaven.

In a recent discussion of our procurement processes, the subject of the first aviation contract ever awarded was mentioned—that with the Wright Brothers. It may interest you to know that document involved most of the basic risks which we discuss daily. Specification No. 486, dated Oct. 23, 1907, requisitioned a totally new weapon system described as a "Flying Machine." It required bidders to submit, with their proposals:

> **Drawings to scale, Statement of Speed for which it is designed, Statement of Total Surface Area of the Supporting Planes, Statement of Total Weight, Description of the Engine which will be used for motive power, and the Material of which the Frame, Plane, and Propellers will be constructed.**

It even recognized the risk of data disclosure in a provision that stated, "Plans received will not be shown to other bidders." I should mention the incentive risk provisions of this historic $24,000 contract. I quote:

> **The flying machine should be designed to have a speed of at least 40 miles per hour in still air, but bidders must submit quotations in their proposals for cost depending upon the speed attained during the trial flight, according to the following scale.**

Forty miles per hour was rated 100 percent of target price; 39 miles per hour, 90 percent; 38 miles per hour, 80 percent; etc., down to 36 miles per hour below which the plane would be rejected. Similarly, on the upward scale, 41 miles per hour was 110 percent; 42 miles per hour, 120 percent; on up to 44 miles per hour at 140 percent of target price. This contract still represents an accepted method for asking the industrial community to share the performance risk of its products.

Since the days of the flying machine contract, many methods and procedures for acquiring systems have evolved. From time to time, performance, schedule, or cost have had varying degrees of emphasis. The risk has been shared or shifted between the Government and industry, *i.e.*, from cost plus a percentage of cost to fixed price. However our primary goal has always been to obtain the best technical performance possible.

To achieve our goal of technical excellence, we have attempted to engage all resources available both within Government and industry. We try to strike a balance on what we want versus what we can get with reasonable risk—"risk" in the sense that we must have an effective product for national defense—(we cannot always wait for the ultimate product). Also, we do feel a sense of responsibility on how much risk we ask a contractor to assume.

The contractor, too, is interested in being associated with a new product. He would like it to be an exciting new product which would enhance his reputation, but not at the expense of profit. So again each participant for his own reasons, whatever they may be, wants to reduce his risk. It is for these reasons that management and procurement techniques have been developed to aid us in achieving our goal or reducing the risk in acquiring operational systems.

### Development Planning

The emphasis which we have placed on development planning is relevant to the reduction of technical risk. This process has been termed "concept formulation." The objective of concept formulation is to provide a technical, economic and military basis for advocacy of new systems, or supporting equipment for improvement of Air Force operational capabilities. Activities included are technology application studies; proposals for advanced development—why demonstration should be done now and not at some later date; and proposals for new systems, subsystems, or major modifications. Included in the last category are preliminary design or tradeoff analyses to establish what is feasible. Emphasis is placed on how contract definition will be conducted, and how the management approach and contract types are selected.

With the advanced engineering and science required today to design and produce a weapon system, we believe the emphasis which we place on development planning has reduced the Government's and industry's risk. We recognize the value of informing industry of our plans for the future and hope industry, too, will perform more and better development planning, and include potential subcontractors in this "look-ahead."

### We Allocate Risk by Our Management Approach

The selection of the program's management structure and type of contract is a key decision in distributing the risk for design and performance. As you know we use two primary management structures in acquiring weapon and support systems. One is the prime subcontractor relationship, where the prime contractor selects the subcontractors, performs the systems engineering, and issues the technical direction to the subcontractors. The Government here has a systems engineering role, but it is limited principally to its relationship with the prime.

The second management arrangement is the associate contractor structure. This method was developed for the *initial* ballistic missile program. Here the Air Force selects the associate contractors, and the Air Force (or another contractor) performs the role of system engineer and issues the technical direction.

Recently, we completed a comprehensive study concerned with the management alternatives available to the Air Force. It came as no surprise that the industrial representatives interviewed prefer the prime subcontractor relationship. One of the reasons given was: "The industrial organization exercising systems engineering on subs has a counter balance of a prime contract with the Government. In contrast, a 'third party' systems engineering contractor has little or no counter balance to compromise his insistence on technical excellence." I quote this because it alerted me that we must thoroughly understand all motivations, and must be watchful of the decision environment which we create in the system acquisition process.

The sheer complexity of some of our development programs demands a technical conscience (representing the Government), *i.e.*, an intensive and detailed participation by either the Government or an objective "third party." The Minuteman program illustrates this point. This program is large with a multitude of configurations. The threat (or at least our understanding of the threat) constantly changes. The state of the art continues to advance—sometimes dramatically. In response to the threat or the technology opportunities, we develop new components or subsystems and modify a fleet already in the field. Under these circumstances, it is not surprising that we, the Government, retain some of the responsibility for design and performance in order to take advantage of unforeseen opportunities, or to avoid undesirable decisions based on contractual incentives which are outmoded by events.

An often expressed opinion is that systems engineering and technical direction clauses are basically incompatible with incentive contracts, incompatible particularly with fixed price incentive contracts, which establish the relative values of alternatives from which the contractor has the freedom to choose in making tradeoff decisions. We have found that the use of contract incentives does not assure that the hardware producing contractor will share the same objectives as the Air Force. Neither party can foresee all the technical difficulties, technical advances, or changes to the operational requirements which may occur in the course of a multiyear program. The Government must participate to maintain a balance in schedule, cost and performance. The Air Force program manager must be held responsible for assuring that the best tradeoff decisions are made within the incentive matrix.

Our recent study of management alternatives confirmed that industry also does not believe that the Air Force can employ a "hands-off" policy and expect to achieve the best operational system. Industry expects the Air Force to isolate technical deficiencies, to make tradeoff studies and, where necessary, to issue technical direction to correct the deficiencies or exploit the more attractive alternatives than may be open. Thus our selection of a management approach and procedures both influences, and is influenced by the technical risk involved.

### Contract Definition

Practically all of our major systems must undergo contract definition before proceeding into development and production. The basic objective of contract definition is to establish sound and achievable performance specifications; precisely define interfaces among the various elements of the total system; and develop creditable schedules and costs suitable for firm, fixed-price contracting, or a fully structured incentive contract.

The process of contract definition tends to bring the competitive proposals closer and closer together by the very nature of the procedures involved in each step of the process. Considerable effort is expended in the evaluation process to examine the soundness and logic of the preliminary design submitted by each competitor to satisfy the requirement. Wind tunnel tests are reviewed; computer runs are carefully examined; and all proposed subsystems are given detailed and careful scrutiny against established Government standards. These evaluation techniques are quite useful in providing an insight as to how well the contractor understands the system problem; the degree to which he has exercised ingenuity and resourcefulness in bringing to bear the proper technology for the solution of the problem; and finally, provide the basis for an assessment of the level of confidence that should be placed in the contractor's promise that he can meet the requirements established for the system in a timely and effective manner.

The dilemma is that we do not contract for the detailed design of the system—and I don't want to imply we should; however, this means that the contractor has no obligation under his contractual commitment to proceed with the basic design concepts which he submitted. In fact, he is free to depart from his ideas, if necessary, to achieve the performance specifications of his contract, or (in his own interest) to seek a better balance in his incentive areas because part of his job turned out to be more difficult or different than anticipated. What this all means is that the superior design approach is non-contractual and not automatically achieved.

On the other hand, we also recognize certain problems and risks for the contractor. Some of these problems are:

- Technical and performance requirements continue to change.
- We may not go far enough in our evaluations to fully understand the technical risks ahead.
- Delayed decisions undoubtedly cause severe management and funding problems for the contractors.
- Subcontractors benefit little from the direct contract definition funding provided to the prime contractors.

## Total Package Experience

Just as contract definition is designed to reduce the risk of the technical unknowns for both Government and industry, the total package procurement concept (TPPC) has been developed to offer a share of financial risk to the contractor. Some people tend to categorize this as an offer with a club in one hand and a pen in the other, but let me assure you this is a two-way street, and it is not clear to me who has the biggest club. In any event, we do not have the objective in our contracting of putting people out of business. We must feel a sense of responsibility in identifying the risk we ask the contractor to assume. Sometimes this is particularly difficult, since we quite often negotiate the contractor's proposals into the contract—not ours. In fact, I sometimes get the impression we are getting blamed for letting the contractor sign a contract which contains the performance he proposed.

As you know, total package procurement contracting envisions that development, production and support requirements for a system be procured under one contract. Price and performance commitments are obtained during the contract definition phase. To date, all total package contracts have been fixed-price incentive.

Our major objectives in total package procurement are to:

- Inhibit "buy-in."
- Permit the Government to use competition more effectively.
- Encourage industry to design for economic production.
- Motivate the contractor to obtain supplies and services from the most efficient source, whether in-house or by subcontract.
- Obtain long-term commitments leading to program stability and continuity.
- Enforce design discipline.
- Encourage efficiency.
- Better control changes.
- Motivate the contractor to control cost.
- Foster program discipline on the part of both the contractor and the Government.

Experience with the TPPC approach has not yet carried through one complete cycle. Results to date illustrate that forces other than engineering and production affect the project either before or after the contract is signed—both in the Government and in the company. The results, as I see them—and I know I see them differently than industry, although I feel I know their objectives, too—have carried us toward the goal of enjoying the benefits of competition, but may have created other problems along the way.

## A Need For Adjustment

So, where does this leave us today? What we need and must mutually work to achieve, in my opinion, is better balance between the financial risk and the risk of the technical unknowns.

Improvements in the contract definition process can help further reduce the technical uncertainties.

Perhaps, as some people contend, contract definition does not go far enough. Perhaps contract definition should include some development and fabrication (or prototype) hardware for test. Under these circumstances, both the contractors and the Government could have more credible information on which to base decisions—resulting in fewer risks to both. However, we must think this option through carefully. The longer a final decision is delayed, the more fierce the competition becomes. Delay increases the risk to the competing sources. The loser will have tied up considerable resources for a longer period of time with limited pay-off. We also must determine if the nation has the technical resources to afford this redundancy.

I believe that less dramatic ways exist for reducing technical risk through more emphasis on independent research and development, advanced development, and component improvement programs. Such emphasis would create a better base on which to build our system performance objectives. I believe we err in waiting for a specific operational requirement before starting most advanced developments.

Although I have mentioned some problems associated with the concept of total package procurement, on balance I believe it has been an improvement and is valid. As applied to the C-5, it is still appropriate for future use. However, we believe that some changes are required to adapt it to the procurement of weapon and support systems.

A recent Air Force Systems Command study on total package procurement concluded that even where the development did not introduce unacceptable technical risk for any single element, the integration of a large system could involve sufficient risk to make the application of total package inappropriate. This finding is primarily predicated on the misgiving that undue emphasis on cost and economic

*(Continued inside back cover)*

# DOD Completes Plans for FY 1969 Expenditure Reductions

The Defense Department has completed plans under Project 693 to reduce FY 1969 expenditures by $3 billion from budget estimates submitted January 1968.

The Revenue and Expenditures Control Act of 1968 requires a total expenditure reduction of $6 billion for the Federal Government. The Defense Department share of this reduction is $3 billion.

Announcing the completion of Project 693 on December 10, then-Secretary of Defense Clark M. Clifford said a thorough review with the Military Departments and Defense Agencies was initiated in early June 1968 to identify areas in which FY 1969 expenditures could be reduced, under three principal guidelines:

- The needs of our forces in Southeast Asia were to be provided for fully, without exceptions.
- The necessary reductions were to be accomplished in such a manner as to minimize their adverse effects on our overall military strength.
- The programs and activities selected for reduction were to be arrived at cooperatively by the Services and the OSD staff, and all proposed changes involving forces and major weapon systems were to be reviewed by the Joint Chiefs of Staff. When agreement could not be reached through this procedure, the issue was to be resolved by the Secretary and Deputy Secretary of Defense.

Final determinations on all actions necessary to meet the Department's expenditure reduction objective could not be made until Congress completed action on the Defense authorization and appropriations bills. However, a number of actions were taken early in order to obtain maximum advantage of the expenditure savings, and these were announced previously by the Department. These included:

- Not to complete activation of the 6th Infantry Division.
- Inactivation of 53 Navy ships and seven Naval Air Squadrons. (The original announcement of 50 ships and eight squadrons made Aug. 7 was subsequently revised to 53 ships and seven squadrons.)
- Inactivation of 23 Nike Hercules firing sites.
- Deactivation of seven F–101 squadrons in the first quarter of this fiscal year instead of later, as previously planned; and the stretch-out of F–111A and FB–111 production schedules.
- Early release from active duty of approximately 30,000 two-year Navy enlistees.
- Reduction of about 2,400 civilian positions in employment levels at Navy laboratories.

Amounts of the reductions made by the Services and the Defense Agencies to reach $3 billion in expenditure cuts for FY 1969 are shown in Figure 1. Also included are the program changes of $5.7 billion in total obligational authority which were required to obtain the FY 1969 $3 billion expenditure reductions.

While the reductions have been made in all areas of DOD operations, the greatest cuts in the case of Army are in the logistical support area for supplies, spares and repair parts levels and equipment maintenance for non-Southeast Asia forces; reductions in equipment procurements for non-Southeast Asia forces consistent with minimum impact on readiness; and reductions in military construction programs.

Major reductions in the Navy are in F–111B aircraft procurement; operational areas including ship and aircraft squadron inactivations, aircraft modification and rework, ship overhauls, administration and logistic support programs; equipment procurement for non-Southeast Asia forces; ship construction, military personnel and research and development programs.

In addition to unit inactivations and revised aircraft production schedules, the Air Force is reducing military and civilian manpower in support activities by 8,000 military and 8,000 civilian spaces; has deferred initiation of expanded proficiency pay awards in five specialist fields; slowed development efforts in the Manned Orbiting Laboratory program and slightly delayed its initial launch; deleted or delayed a number of construction projects; and reduced or delayed a variety of research, development, test and evaluation programs.

In OSD and the Defense Agencies, the major actions were reductions of not less than 3 percent in administrative areas, and reductions in the procurement programs for computer equipment and inventory levels in the Defense Stock Fund.

**Defense Department**
**Expenditure and Program Reductions**

**($ in millions)**

| | FY 1969 Expenditure Reductions | Total Program Reductions |
|---|---|---|
| Department of Army | $ 900.0 | $1,443.3 |
| Department of Navy | 992.0 | 2,396.0 |
| Department of Air Force | 928.0 | 1,547.4 |
| Denfense Agencies | 180.0 | 346.4 |
| Total | $3,000.0 | $5,733.1 |

Figure 1.

# The Management of Military Supply Support and Logistics Services

Lieutenant General Earl C. Hedlund, USAF

**Editors Note: This article on the Defense Supply Agency begins a series on the material and logistics commands of the Defense Department. Future articles will describe the Military Services' commands and subcommands, and subcommands of DSA.**

The Defense Supply Agency (DSA) is a military department store with annual sales exceeding $3.5 billion dollars.

The agency purchases and distributes supplies and provides logistic services common to all of the Military Services.

It is my intention here to outline the mission of the agency, its organization and functions, to describe the DSA management approach, and summarize our relationships with the Military Services' logistics systems.

The Defense Supply Agency was created by the Secretary of Defense in 1961 to increase efficiency of, and reduce the cost of managing common military supply items and logistics services, by eliminating overlapping and duplicating organizations, systems and procedures of the Military Services. Consolidating these responsibilities in DSA has one overall objective—effective and timely logistics support of operating forces at the lowest possible cost to the taxpayer. The mission is threefold:

- To provide wholesale supply support to the Defense Department and certain other specified government agencies.
- To provide consolidated field contract administration services to the entire Defense Department and the National Aeronautics and Space Administration.
- To provide certain DOD-wide logistics services and to administer or manage assigned logistics programs.

These responsibilities are carried out by a complex of DSA facilities located throughout the country. In addition to the DSA headquarters located in Alexandria, Va., there are six commodity-oriented supply centers, eight depots or depot activities, three activities providing logistics services, and eleven contract administration services regional organizations.

Staffing these activities are 1,100 military personnel from all the Military Services and over 57,000 civilian personnel, most of whom came to DSA from the three Military Departments.

Supplies procured by DSA range from fuel, food and clothing to industrial and construction equipment. The extent of its supply support operations is best illustrated by some basic statistics on DSA.

- DSA centrally manages some 1.9 million items of the 4 million items in the military part of the Federal Supply Catalog.
- Inventory at the end of FY 1968 was about $3 billion.
- Issues or sales to customers during FY 1968 totaled $3.8 billion.
- Procurements for the same period exceeded $5.3 billion, including $1.5 billion in bulk fuels and lubricants which were turned over directly to the Services and are not included in inventory or sales figures.
- Over 90 percent of the requisi-

tions received from customers were filled from available stock, and 82 percent of these within the time specified in the Uniform Materiel Movement Issue Priority System.

Requisitions from DSA's customers are processed at six Defense Supply Centers which procure the supplies. Five of these centers perform a full range of supply management functions. At these centers, supply demands are electronically processed against system-wide accountable records. Financial accounting, billing and collecting are likewise centralized. The sixth center, the Defense Fuel Supply Center, is primarily a purchasing activity, as inventories of bulk and solid fuels are not maintained by DSA.

Eleven depots comprise DSA's Distribution System. Seven of these are called Principal Depots because we stock in them a wide range of DSA materiel. Two of these are co-located with Defense Supply Centers at Columbus, Ohio, and Richmond, Va.; one is the Army Depot at Atlanta, Ga.; and the other four at Mechanicsburg, Pa.; Memphis, Tenn.; Ogden, Utah; and Tracy, Calif.

The remaining four are called Specialized Support Depots. Two of these are specialized by commodity and are co-located with the Defense Electronic Supply Center at Dayton, Ohio, and the Defense Personnel Support Center at Philadelphia. And, finally, two are specialized by mission and are located at the Navy Supply Centers, Oakland and Norfolk in support of Navy's fleet and overseas units.

We also have 10 direct supply support points which support large volume users of specific commodities, such as metal bars and shapes used by naval shipyards and clothing for recruit training centers.

The scope of logistical services provided by DSA cover not only the purchase, storage and issue of materiel, but includes contract administration services. This element of the DSA mission is concerned with the administration of contracts *in the field* after they have been awarded to contractors. DSA provides contract administration services to the Defense Department and the National Aeronautics and Space Administration (NASA). DSA contract administration services encompass:

- Security clearance of contractor plants and personnel.
- Administration of contracts after their award by procurement officers of the Services, DSA and NASA.
- Production and progress reporting.
- Inspection and acceptance of materiel and quality assurance.
- Accounting for government-owned property furnished to contractors.
- Payment to contractors for goods and services delivered.

DSA's Contract Administration Services organization, which carries out these functions, consists of 11 Defense Contract Administration Services Regions (DCASRs) throughout the United States and a central Industrial Security Clearance Office in Columbus, Ohio. (See article "DCAS Comes of Age" *Defense Industry Bulletin*, May 1968, page 1.)

At the end of FY 1968, DSA was administering some 258,000 prime and secondary contracts valued at over $50 billion. During the year over $20.6 billion worth of materiel was inspected and released for shipment, and some two million contractor invoices were paid.

In addition to supply and contract administration, the DSA mission includes providing a number of logistical services and administration of several DOD-wide programs. These services and programs are:

- The Federal Catalog program.
- Defense material utilization and disposal programs.
- Coordinated procurement program.
- Management of receipt, storage, retrieval and issue of defense research and technical documentation. (See article, "Program and Services of the Defense Documentation Center," *Defense Industry Bulletin*, April 1968, page 1.)
- Management of defense-owned industrial plant equipment.
- Design, development and maintenance of the military standard data systems procedures for requisitioning and issue, transaction reporting and accounting, materiel movement and transportation, supply system evaluation, and contract administration services.

Having described its mission and how DSA is structured to carry out these objectives, I would like to outline how the agency is managed.

## Management Must Respond to Variety of Demands

The Director of the Defense Supply Agency reports directly to the Secretary of Defense. Certain guidance and direction come from the Assistant Secretaries of Defense (Installations and Logistics) and (Comptroller). Policy guidance on the defense technical documentation function comes from the Director of Defense Research and Engineering. The Assistant Secretary of Defense (Manpower and Reserve Affairs) gives guidance in civilian and military personnel matters.

All of these offices require reports on a variety of matters, including inventory range and depth, supply performance, changes to the Supply Catalog, and in what manner resources are allocated. For example, there are limits on the number of personnel who can be hired, the amount of dollars which can be spent, and the extent of authority or exercise of local judgments under certain circumstances.

This division of responsibilities is not greatly different from other government organizations. What distinguishes DSA is that the agency is

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purely a service organization. DSA exists only to provide supply and service support to the armed forces. Consequently, in addition to the "bosses" already mentioned, DSA has many more—its customers. Our responsibility is to provide responsive, effective support to a wide variety of demands from a multitude of customers around the world. Thus, we have a number of "bosses" to satisfy.

Its customers place requirements on DSA as a result of the military operations they face. Frequently these requirements are not predictable. Consequently, DSA is not always able to respond as quickly and as positively as it would like. For example, DSA has recently been working out of a problem with repair parts for construction equipment, power generating machinery, and other equipment, which stems from not being informed of the need for these parts in time to procure them.

Solution of these problems and responses to changes in workload and program emphasis are management challenges of the first order. DSA managers must be skilled in many facets of military logistics, and flexible as well as responsive. They must be able to reorient and apply the work force in response to these changes.

## Integrated Support Functions

A real management problem was posed to DSA early in its history—develop a single integrated system from the several systems inherited from the Military Services. Many customers were, and still are, oriented to project or program management, which is designed to insure maximum support of individual projects or weapon systems. Project management, however, is not desirable for controlling the 1.9 million items which DSA manages, many of which are common to more than one end item or weapon system. Nor is project management desirable for the wide variety of DSA logistics services.

TROPICAL COMBAT boots, one of the common use items bought by the DSA Defense Personnel Support Center.

Therefore, DSA needed other means of insuring that our basic support mission would work, and had to design procedures to evaluate the *performance effectiveness* of our common support functions. Support objectives were clarified and, through a cost effectiveness analysis of many alternative organizational, functional and operating procedures, the present system was developed. Present procedures provide across-the-board support for all the items required. This system might be called "process management." We control the effectiveness of our operating procedures by evaluating the total logistics support process—instead of evaluating the support given individual items, weapon systems, or projects.

Process management caused us to delve deeply into the various means of monitoring and evaluating management. DSA adopted a concept of strong, central policy guidance, direction and control, and maximum decentralization of operating authority. In order to make such a system work effectively, DSA top management devised means to exercise control and at all times be informed of how policies are carried out. Uniform organizational elements, staffing patterns and procedures were installed in the field activities. Reporting, data processing, and management information systems were standardized. These standardized systems permit DSA to divide the total logistics support mission into identifiable and manageable segments, to coordinate and summarize millions of individual transactions, and to automatically provide every level of DSA field and headquarters management with the precise data needed for effective and timely decision making. Simply stated, these standardized systems and procedures enable the man at the top to concentrate on management—to assure that thousands of things come out right at the other end. They make it possible to operate as a highly centralized organization.

## Resource Management System

To complement and support this centralized procedural system, we have an executive communications, review and analysis system which communicates problem areas to the Director without delay as these manifest themselves.

By establishing specific goals or key indicators of performance for each supply process, DSA insures that top management is apprised, on a timely basis, of the status of all its operations. Consequently, top management can make rapid evaluation of each supply process. The system also provides the basis for formal management of resources and workload through the DSA programming and budgeting system. This system, which is similar to those used in the Military Departments and other government agencies, integrates programming, budgeting, manpower, accounting, and performance evaluation, and permits us to cost out the supply processes or functions, no matter where they are performed in the agency.

To insure maximum communication among the various levels of management, and to permit maximum management by exception, DSA uses a Resource Management System composed of a series of subsystems.

The first subsystem relates programming and budgeting. It is the means by which workload forecasts and resource requirements are set for each functional program area. Workloads developed through this system, when equated to resource requirements, become the basis for the annual financial plan and staffing programs established for each field activity. Performance appraisal compares actual program performance and resource consumption with annual forecasts and objectives to determine any need to reapportion or reallocate resources.

The subsystem for cost accounting is related to the DOD program budget system through common functional classification structure. Cost accounting provides manpower and cost-expense data reflecting the manner in which available personnel and dollar resources are applied and consumed.

The management information subsystem is the prime medium for reporting progress to the Director.

Through recurring management reports, it provides basic data on operating program results. This subsystem accumulates manpower, cost and performance data which are deposited in a mechanized central data bank. This data bank is the source of most of the management data used in our program performance evaluation.

Performance evaluation reports are one of the prime management tools used at DSA headquarters. This subsystem evaluates resource use in relation to operating results by comparing actual performance with statistical or engineered standards. It alerts us to changing conditions which may require reapportionment of available manpower and funds. It provides timely and factual information for continual "tracking" and appraising how efficiently and effectively available manpower and financial resources are being used to accomplish some 75 different logistics functions.

### Command Objectives Program

Complementing the Resource Management System is another management system, the Command Objectives Program, which has substantially aided DSA management. The Command Objectives Program identifies those areas which warrant special management effort, reaching into virtually every corner of DSA activities.

The Command Objectives Program is, by concept and design, action oriented. Once an objective is established, primary actions required to attain that objective are listed and broken down into secondary actions, with specific dates set for accomplishment of each action.

These are called Headquarters "Do List Items." Every 90 days I personally review each "Do List Item" with the executive director concerned, along with responsible action officers assigned to accomplish or coordinate the action. During these reviews, which are informal give-and-take sessions, we determine, and attempt to resolve, problem areas.

The DSA Command Objectives Program places maximum emphasis on identifying the main jobs to be done, on establishing a timetable for completing all actions, on determining who is to take action, and on keeping performance factors in sharp focus so that management can react with timely, responsive decisions.

In addition to the Resource Management System and the Command Objectives Program, the operations control "loop" is closed by the management review system. Through this system top management can critically review the results of its operations. These reviews are the forums for collective consideration of actual or potential problems. Several different management techniques are used to follow up on performance and improve agency communications.

For example, there are weekly meetings between the Director and the principal DSA staff. Each month DSA's Comptroller presents a performance evaluation of the entire agency. Also, every month one meeting includes a general intelligence summary by a representative of the Defense Intelligence Agency. This keeps the senior staff and the Director abreast of world developments which may impact on DSA support of the Military Services.

Conferences attended by commanders of the major field activities are held bi-monthly. Once a year a three-day conference is held with field commanders and headquarters principal staff members for a deep and thorough review of the agency's operations.

DSA semi-annual staff reviews usually last three days, and provide the Director with an in-depth review of current and pending staff action.

Weekly Highlight Reports summarizing events throughout the agency are routed to all staff elements; they provide field commanders and staff officers an additional channel for informal reports of general interest.

Inspector General reports provide information and recommendations concerning efficiency, effectiveness, economy, morale and discipline within the headquarters and field activities. Auditor General reports, which are similar to Inspector General reports in that they are made by a non-operating official responsible only to the Director, are our internal audit process. Those reports help me assure that management controls, at all levels of our operations, are adequate, effective and properly applied.

This array of management information, analysis and evaluation of DSA's diversified operations provides the Director necessary information on all facets of DSA performance and goes a long way toward avoiding unwelcome surprises.

### Transportation Management

To this point, this article has dealt with the broad aspects of DSA management. Let us now focus attention on a particular functional area—transportation management.

The traffic management role of DSA is to insure that materiel is delivered to the proper destination at the required time, in good condition, and at the lowest reasonable cost.

Within the Defense Department logistics systems, DSA is responsible for the first and second destination movement of supplies which it manages. First destination responsibility concerns the movement of materiel from the producer into the DSA distribution system. Second, DSA moves the materiel from storage or distribution points to the military customer. Direct vendor deliveries are made whenever feasible and timely.

To carry out its task, DSA maintains the closest working relationship with the Military Traffic Management and Terminal Service (MTMTS). MTMTS, under the Department of the Army, provides a traffic management service in the continental United States to all Military Departments (an inter-Service arrangement paralleled by the Military Sea Transport Service under the Navy and the Military Airlift Command under the Air Force). DSA receives information on more than a quarter million MTMTS traffic management actions annually and has become its largest customer.

Actually, DSA must do business with the transportation systems of all the Military Services. Each Service has its own system to meet its particular transportation needs. The DSA mission is to put the supplies the Service specifies into its transportation system. To do so, DSA must understand the Services' transportation systems and reflect the needs of the Services in planning DSA operations. Also, DSA must stay abreast of developments in each Service, and make maximum use of advances in their technology.

The agency's traffic management and transportation activities are extensive. In a single month, DSA handles 14,500 truckloads and 3,500 railcars of materiel. This represents about

85,000 short tons in and 111,000 short tons out of the system each month, and involves the processing of some 27,000 bills of lading for inbound and 52,000 for outbound shipments monthly. In FY 1968, the depots received 1.3 million short tons of supplies in 89,000 truckloads and 28,000 railcar loads. In addition, depots received approximately 436,000 parcel post shipments. During FY 1968, depots shipped 1.5 million short tons of supplies in 133,000 truckloads and railcar loads, and sent 8.7 million parcel post shipments. Second destination transportation cost $63.4 million in FY 1968.

The DSA Defense Contract Administration Services (DCAS) has within its organization a transportation entity to manage that part of the procurement function. DCAS issues half a million government bills of lading (GBL) a year via all modes of transportation.

One innovation in the DCAS transportation function illustrates the fact, earlier mentioned, that DSA utilizes techniques of each of the Military Services. Under a technique borrowed from the Air Force, a DCAS field representative will evaluate a contractor's traffic management capability and place blocks of signed GBLs with him. Thereafter, the contractor himself completes and executes the GBL and, in many cases, deals directly with MTMTS for specific routings. Generally, where loads do not require dealing with MTMTS, the contractor selects commercial shipping routes.

In another innovation, DCAS has successfully service-tested the mechanization of the GBL register and can extract data heretofore not available. That data gives a clear picture of the distribution of tonnage by mode, weight and cost into various destinations. From such data, DSA managers can plan consolidation, containerization and transportation economics. Future steps will include mechanized GBL preparation and direct communications between computer systems.

Another aspect of traffic management is the distribution and positioning of stocks. Again, the guiding criterion is responsiveness to the military customer. Stocks are positioned to maintain a minimum of inventory and yet eliminate expensive cross-haul and back-haul. High-repetitive-demand items are positioned at stock points consistent with consumption patterns. Slow-moving, insurance-type items and high-value items are positioned at the fewest number of locations consistent with known user needs. Items requiring special storage conditions are positioned at locations having the needed capability.

Positioning of stocks has received considerable attention lately. The situation in Southeast Asia focused attention on the fact that our logistics system had been deliberately oriented toward Europe. About 69 percent of the deliveries are presently made to customers in the Pacific area. With the majority of DSA depots located east of the Mississippi River, we do not have sufficient open and covered storage in the general area of West Coast terminals. However, before starting a crash program to build or lease additional space, we considered the transportation aspects of the problem. We found that customers could be supported from the eastern depots with no appreciable increase in transit time, and with some lower overall costs to the Government. Overall cost covers the total transportation bill—inland freight, port handling charges, ocean carriage and discharge costs—to move a shipment by various routings from the contractor's plant or defense depot to the oversea customer. Some commodities can be shipped to Southeast Asia from East Coast ports at a lower overall cost than shipping across country to an ocean terminal on the Pacific coast.

The lowest overall cost can also be considered for air shipments. In view of the size and speed of present cargo aircraft, and the imminent introduction of the C–5A into the defense inventory, selection of a departure airfield in the United States closest to the overseas customer is no longer a major consideration.

Last year, DSA started a uniform shipment plan to achieve two major operational improvements. First, transportation knowledge is put to work at the beginning of the shipment planning cycle and, second, artificial constraints on shipment consolidation were abolished.

Keeping up with new innovations, DSA use of intermodal containers is rapidly increasing. These containers can be transported over the road on wheeled frames, by rail on flatcars, and aboard ship, either on deck or in specially designed hatch space. Depending on design, containers can be used for a variety of cargoes, including liquids and refrigerated perishables.

Reduced handling, pilferage, spoilage and damage in container shipments contribute to greater efficiency over conventional methods. Off-loading time is reduced. Perishable foods, which are not suitable for conventional methods, can be shipped overseas in containers. For example, our fighting men in Vietnam have enjoyed tons of fresh sweet corn which was transported in refrigerated containers.

DSA is also prepared to meet various transportation emergencies, ranging from regional labor-management disputes to general nuclear war and the imposition of government controls over civil transport. During the planning phase, DSA participation has been primarily with Defense Department offices. DSA will establish close coordination with other Federal agencies and carrier associations.

One more transportation subject brings us full cycle, back to the DSA mission stated at the beginning of this article. We are constantly aware that everything we do must contribute to putting needed supplies in the hands of the user, when, where, and how he wants them. Consequently DSA has systems and procedures to evaluate how well we are doing the job.

A traffic management quality assurance program has been developed and implemented—the Military Supply and Transportation Evaluation Procedures (MILSTEP). This system measures total pipeline reaction time, point-to-point and carrier performance reports. A central data collection point receives intransit data for each GBL and for each shipment unit moving overseas. A central processing point matches these intransit data with supply item information and produces total pipeline reports.

The purpose of MILSTEP is twofold. First, it insures that the supply and traffic management operations at our centers and depots meet the standards set for them. Second, it assures that these services are provided as economically as possible. As we find weak points, necessary corrective steps will be taken.

## Improved Purchasing Techniques

The overview of DSA management which I have here presented would be incomplete without mention of the intense management attention being given to improvement of purchasing techniques.

Many readers are aware of the wide press coverage given last spring to some examples of poor buys by DSA and other elements of the Defense Department. Needless to say, a great deal of management effort has been expended to determine the incidence of overpricing and its causes, and to correct deficiencies.

Before going into specifics, some statistics will, hopefully, put the problem into perspective. In FY 1968 DSA executed about 848,000 individual purchase actions, totalling about $5.3 billion. About one-third of these were large buys (over $2,500), accounting for about 94.6 percent of the dollars. Problems in this area were minimal, largely because of the intensive management attention applied to big dollar buys. Small buys, under $2,500, reached a surprising total of over $289.4 million, and encompassed over 597,000 transactions averaging about $48 each.

By using statistical sampling techniques, we found during FY 1967 that approximately 94 percent of our small purchases met very strict criteria and were reasonably priced. We applied a similar sampling technique to the three months ending January 1968 and found that improvement efforts had paid off. Overpriced purchases had been reduced by about two-thirds, so that only some 2 percent remained susceptible to overpricing.

During the past two years DSA managers have devoted primary efforts to responsive support of the military forces operating in or assigned to Southeast Asia. Under the Vietnam buildup, DSA's small purchase workload doubled at many purchasing offices and the number of urgent orders increased sharply. Many new junior buyers were hired, and it became necessary to place considerable responsibility on them even though time did not permit thorough training. In addition, some buying offices have experienced a 50 percent turnover of personnel in the last three years, with the heaviest losses among trained buyers. Nevertheless, grossly overpriced purchases are not typical of DSA small purchase operations.

Examination of the causes showed no paucity of sound policy nor lack of techniques for making good purchases. The greatest shortfall was in providing buyers with adequate technical information and adequate training and supervision.

Although all the problems have not been fully solved, improvements have been made. Quality of personnel has been improved by upgrading their training, pay and guidance. Contractors' pricing policies are scrutinized more closely. Better item data is obtained. Paper flow is being reduced by increased automation in the purchasing function.

In a memorandum issued to the Military Services and DSA on the selection of responsible contractors, the Secretary of Defense reemphasized the importance of selecting only fully qualified sources. In keeping with this direction, we continue to improve techniques for screening potential suppliers. For example, DSA has recently installed a contractor experience list, which includes names of those contractors whose performance has been less than satisfactory. These firms are not excluded from bidding, but before a contract is awarded to one of these firms, the contracting officer is alerted to the need for detailed review and evaluation, including a pre-award survey of the firm. In addition, procurement regulations now define more precisely the circumstances under which pre-award surveys will be performed and the depth of the surveys in determining production, quality and financial capabilities. Regulations also establish standards to be met if a pre-award survey is not to be made. This involves full justification for waiver of the survey, as well as higher level management review of high-dollar-value awards. This added guidance should more rigidly safeguard against awards to marginal producers.

The military operations in Southeast Asia have provided a most severe test of the concept on which DSA was founded, and of its logistics management policies and procedures. DSA managers and personnel are acutely aware of our position in the logistics support picture: our customers depend solely on us for service—there is no other source. This sense of military urgency permeates the headquarters and field activities, and we are constantly seeking better ways to respond to our customers' changing needs.

There is a continuing need for management improvements. This challenges every manager at every level of DSA operations.

TRANSFER TERMINAL of Eastern Area MTMTS, through which Defense Supply Agency ships supplies to its customers.

# DEFENSE SU

Cameron Station
Telephone

D
LIEUTENANT GENERAL EARL C
DEPUT
MAJOR GENERAL ROBERT C
EX
EXECUTIVE, COLONEL DAVID

Editor's Note: Organization charts appearing in the Bulletin are edited by the editorial staff to reflect those elements of the various DOD organizations which are of interest to industry representatives. Organizational elements not involved in the DOD-industry relationship have been eliminated because of space limitations.

The information on personnel, room and telephone numbers is as current as is possible to obtain at the time we go to press. Basic information in this chart was extracted from the Defense Supply Agency organization chart dated Oct. 1, 1968, and is updated insofar as was possible.

## COUNSEL

| | | |
|---|---|---|
| Counsel<br>R M Lemke | 3D330 | 46156 |
| Associate Counsel<br>W P Weston | 3D322 | 46165 |

## INSPECTOR GENERAL

| | | |
|---|---|---|
| Inspector General<br>Col R I Ciraldo, USA | 3C325 | 46057 |
| Deputy Inspector General<br>Col R L Renker, USAF | 3C325 | 46058 |

## ASSISTANT DIRECTOR PLANS, PROGRAMS AND SYSTEMS

| | | |
|---|---|---|
| Assistant Director<br>RAdm I F Haddock, USN | 3A426 | 46271 |
| Deputy Assistant Director<br>Brig Gen R H Spanjer, USMC | 3A426 | 46487 |
| Executive Officer<br>Lt Col E C Merkl, USA | 3A426 | 46274 |

## COMPTR

Comptroller
M H Baker
Deputy Comptroller
Col A A Tisone, USAF
Executive Officer
Lt Col G V Wise, USA

## EXECUTIVE DIRECTOR SUPPLY OPERATIONS

| | | |
|---|---|---|
| Executive Dir, Maj Gen T H Scott Jr, USA | 4D276 | 46101 |
| Deputy Executive Director, E H Neese | 4D276 | 46102 |
| Executive Officer, Col J P Balkman, USA | 4D276 | 46104 |
| Logistics Programs Div, Chief, A P Roberts | 4C261 | 46097 |
| Supply Mgt Div, Chief, Capt L F ReDavid, USN | 4B455 | 46091 |
| Emerg Supply Ops Cen, Lt Col G Kaden, USAF | 4D327 | 46171 |
| Civil Def Materiel Div, Chief, M V Williams | 4C456 | 47667 |
| Depot Opns Div, Chief, Col W A Steiger, USA | 3D240 | 46094 |

## EXECUTIVE DIRECTOR PROCUREMENT AND PRODUCTION

| | | |
|---|---|---|
| Executive Director, Brig Gen R E Lee, USAF | 4D231 | 46401 |
| Deputy Executive Director, D R Babione | 4D231 | 46403 |
| Executive Officer, Lt Col J B Fagan, USAF | 4D231 | 46402 |
| Small Business Advisor, J F Ross | 4C128 | 46471 |
| Procurement Div, Chief, H Margulis | 4D152 | 46417 |
| Production, Quality and Reliability Div, Chief, Col P B Henshaw, USA | 4B163 | 46441 |

## EXECUTIVE DIRECTOR TECHNICAL AND LOGISTICS SERVICES

| | | |
|---|---|---|
| Exec Dir, Brig Gen J A Brooks III, USAF | 4D530 | 46771 |
| Deputy Executive Director, R G Bruner | 4D530 | 46773 |
| Executive Officer, Lt Col J B Booth, USAF | 4D530 | 46773 |
| Programs & Analysis Div, L Trenary | 4D514 | 46757 |
| Cataloging & Tech Data Div, Chief, S Schatz | 4D558 | 46751 |
| Utilization Div, Chief, Col R Savilla, USA | 4D570 | 56704 |
| Disposal Div, Chief, P M Somerville | 4C541 | 46765 |
| Engineering Programs Division, Chief, Capt R O Lewis, USN | 4A586 | 46781 |
| R&D VE/VA Advisor, E O Kruegel | 4B476 | 47178 |

## MAJOR FIELD ACTIVITIES

### SUPPLY CENTERS

**DEFENSE CONSTRUCTION SUPPLY CENTER**
Columbus, Ohio 43215
Telephone: 236 + Ext. Area Code: 614

| | |
|---|---|
| Commander,<br>Maj Gen E M Tally, USAF | 2166 |
| Deputy Commander,<br>Col J H Ford, Jr., USA | 2167 |

**DEFENSE ELECTRONICS SUPPLY CENTER**
1507 Wilmington Pike, Dayton, Ohio 45401
Telephone: 252-6551 Area Code: 513

| | |
|---|---|
| Commander,<br>Brig Gen G J McClernon, USAF | 28141 |
| Deputy Commander,<br>Capt T B Purvis, Jr., USN | 21145 |

**DEFENSE FUEL SUPPLY CENTER**
Cameron Station, Alexandria, Virginia 22314
Telephone: 974-7401 Area Code: 202

| | |
|---|---|
| Commander,<br>RAdm F W Martin, USN | 47401 |
| Deputy Commander,<br>Col L Stann, USAF | 47403 |

**DEFENSE GENERAL SUPPLY CENTER**
Richmond, Virginia 23219
Telephone: 275-3861 Area Code: 703

| | |
|---|---|
| Commander,<br>Brig Gen J D Hines, USA | 3000 |
| Deputy Commander,<br>Capt T H Dawson, III, USN | 3200 |

**DEFENSE INDUSTRIAL SUPPLY CENTER**
700 Robbins Ave, Philadelphia, Pa. 19111
Telephone: 697 + Ext. Area Code: 215

| | |
|---|---|
| Commander,<br>RAdm G C Heffner, USN | 2300 |
| Deputy Commander<br>Col I J Kirshrot, USA | |

**DEFENSE PERSONNEL SUPPORT CENTER**
2800 S 20th St., Philadelphia, Pa. 19101
Telephone: 271 + Ext. Area Code: 215

| | |
|---|---|
| Commander,<br>Brig Gen W M Mantz, USA | 2300 |
| Deputy Commander,<br>Col D G Bussey, USAF | 3002 |

### DEPOTS

**DEFENSE DEPOT MECHANICSBURG**
Mechanicsburg, Pennsylvania 17055
Telephone: 766-8511 Area Code: 717

| | |
|---|---|
| Commander,<br>Capt C J Stringer, USN | 2324 |
| Deputy Commander,<br>Col C M Anderson, USAF | 2382 |

**DEFENSE DEPOT MEMPHIS**
Memphis, Tennessee 38115
Telephone: 743-3410 Area Code: 901

| | |
|---|---|
| Commander,<br>Col T I Martin, USA | 411 |
| Deputy Commander,<br>Capt K Bennett, USN | 412 |

**DEFENSE DEPOT OGDEN**
Ogden, Utah 84401
Telephone: 399-7011 Area Code: 801

| | |
|---|---|
| Commander,<br>Col R B Ladd, USAF | 7021 |
| Deputy Commander,<br>Capt R H Haslett, USN | 7938 |

**DEFENSE DEPOT TRACY**
Tracy, California 95376
Telephone: 835-0800 Area Code: 209

| | |
|---|---|
| Commander,<br>Capt R C Dexter, Jr., USN | 5279 |
| Deputy Commander,<br>Col R A Riddle, USA | 5208 |

### SERVICE CENTERS

**DEFENSE DOCUMENTATION CENTER**
Cameron Station, Alexandria, Virginia 22314
Telephone: 974-6916 Area Code: 202

| | |
|---|---|
| Administrator,<br>Dr R B Stegmaier, Jr. | 46800 |
| Deputy Administrator,<br>A G Abdian | 46882 |

**DEFENSE INDUSTRIAL PLANT EQUIPMENT CENTER**
Defense Depot Memphis, Memphis, Tenn. 38102
Telephone: 743-3410 Area Code: 901

| | |
|---|---|
| Commander,<br>Capt H D Byrd, USN | 501 |
| Executive Director,<br>H R Carrington | 502 |

**DEFENSE LOGISTICS SERVICES CENTER**
Federal Center, Battle Creek, Michigan 49016
Telephone: 962-6511 Area Code: 616

| | |
|---|---|
| Commander,<br>Capt R A Porter, USN | 6666 |
| Deputy Commander,<br>Col R A Marsh, USAF | 6668 |

**DEFENSE SUPPLY AGENCY ADMINISTRATIVE SUPPORT CENTER**
Cameron Station, Alexandria, Virginia 22314
Telephone: 974-6003 Area Code: 202

| | |
|---|---|
| Commander,<br>Col S A MacKenzie, USA | 46003 |
| Deputy Commander,<br>Col J H Vines, USAF | 46004 |

# .Y AGENCY

ria, Va. 22314
)7 + Ext.

| | | |
|---|---|---|
| D, USAF | 3A150 | 46111 |
| TOR | | |
| SA | 3A150 | 46113 |
| T JR, USA | 3A150 | 46115 |

### DEPUTY DIRECTOR (CONTRACT ADMINISTRATION SERVICES)

| | | |
|---|---|---|
| Deputy Director, RAdm J L Howard, USN | 8A320 | 47091 |
| Asst Deputy Director, W R Senter | 8A320 | 47091 |
| Executive Officer, Lt Col M J Tashjian USAF | 8A320 | 47091 |

| | |
|---|---|
| 3D528 | 46201 |
| 3D528 | 46203 |
| 3D528 | 46204 |

### SPECIAL ASSISTANT FOR PUBLIC AFFAIRS

| | | |
|---|---|---|
| Special Asst for Public Affairs<br>E F Hart | 3A210 | 46135 |
| Deputy Special Asst for Public Affairs<br>H L Schon | 3A215 | 46242 |
| Military Asst for Public Affairs<br>Cdr W L Frelander, USN | 3A210 | 46135 |

### OFFICE OF PLANS AND MANAGEMENT

| | | |
|---|---|---|
| Chief<br>J E Pernice | 8A334 | 47571 |
| Deputy Chief<br>Cdr T R Downs, USN | 8A334 | 47571 |
| Executive Officer<br>Cdr J G Tapp, USN | 8A334 | 47571 |

### OFFICE OF MANAGEMENT REVIEW

| | | |
|---|---|---|
| Chief<br>Col F G Everett Jr, USA (Acting) | 8A349 | 47570 |
| Deputy Chief<br>H W Peterson | 8A349 | 47570 |

### OFFICE OF MANAGEMENT CONTROL

| | | |
|---|---|---|
| Chief<br>Lt Col J B Pompan, USAF | 8B343 | 47550 |

### OFFICE OF INDUSTRIAL SECURITY

| | | |
|---|---|---|
| ief, Col B C Marshall, USAF | 8A392 | 47594 |
| puty Chief, G H Davis | 8A392 | 47594 |
| ograms & Systems Div, T J O'Brien | 8A402 | 47601 |
| ld Mgt Div, Lt Col B C Young, USA (Acting) | 8A415 | 47701 |
| ternational Programs Div, J J Norton | 8A398 | 47591 |

### OFFICE OF CONTRACTS COMPLIANCE

| | | |
|---|---|---|
| Chief, M R Shafer | 8A489 | 47201 |
| Programs & Systems Div, J Shannon | 8A489 | 47201 |
| Field Operations Div, A R Jarrett | 8C250 | 47101 |

### EXECUTIVE DIRECTOR CONTRACT ADMINISTRATION

| | | |
|---|---|---|
| ecutive Director, Col E H Robertson, USAF | 8A430 | 47704 |
| puty Executive Director, W V Gordon | 8A430 | 47705 |
| ecutive Officer, Lt Col W K Dickson, USAF | 8A430 | 47706 |
| nancial Svcs Div, Cdr R M McDaniel, USN | 8A471 | 47615 |
| ntract Div, Col W J Keating, USA | 8B461 | 47625 |
| dustrial Property Mgt Div, M Reinstein | 8A454 | 47707 |
| ans & Policies Ofc, B Eisenstein (Acting) | 8B427 | 47731 |
| SPR Contract Admin Panel Mbr, R E Rodney (Alternate) | 8B427 | 46787 |
| st for Small Business, G C Tolton | 8B390 | 47605 |

### EXECUTIVE DIRECTOR PRODUCTION

| | | |
|---|---|---|
| Executive Director, J S Groupe | 8D425 | 47647 |
| Deputy Executive Dir, Col W A Fickling, USAF | 8D425 | 47648 |
| Executive Officer, Maj D E Press, USA | 8D425 | 47649 |
| Industrial Labor Relations, D J Bertsch | 8D458 | 47661 |
| Production Mgt Div, Capt M Cohn, USN | 8D435 | 47651 |
| Industrial Resources & Mobilization Planning Div, H F Eichelkraut | 8C403 | 47764 |
| Systems & Engr Div, Col L W Worthing, USA | 8D416 | 47544 |
| Trans & Traffic Mgt Div, T B Gudis | 8B402 | 47721 |

### EXECUTIVE DIRECTOR QUALITY ASSURANCE

| | | |
|---|---|---|
| Executive Director, Col J C Coyne, USA | 8D468 | 47754 |
| Deputy Executive Director, G J Soares | 8D468 | 47754 |
| Executive Officer, Maj F P Norrod, USA | 8D477 | 47756 |
| Mat Quality Div, Col W A Bridenstine, USA | 8C479 | 47658 |
| Plans & Policies Div T M Vining | 8D490 | 47745 |
| QA Engineering Div, G G Gula | 8C444 | 47785 |
| Spec Safety & Flight Opns Div, Lt Col L E Ward, USAF | 8D490 | 47655 |

## MAJOR FIELD ACTIVITIES

### DEFENSE CONTRACT ADMINISTRATION SERVICES REGIONS (DCASRs)

#### DCASR ATLANTA

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| | |
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| Deputy,<br>C T Patterson | 412 |

#### DCASR DALLAS

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|---|---|
| Commander,<br>Capt W G Normile, USN | RI 9-2371 |
| Deputy,<br>P H Packard | RI 9-2373 |

#### DCASR PHILADELPHIA

2800 S. 20th St. Philadelphia, Pa. 19101
Telephone: 271 + Ext. Area Code: 215

| | |
|---|---|
| Commander,<br>Col G Johnson Jr., USA | 4000 |
| Deputy,<br>W F Rathgeber, Jr. | 4002 |

#### DCASR BOSTON

666 Summer Street, Boston, Mass. 02210
Telephone: 542-6000 Area Code: 617

| | |
|---|---|
| Commander,<br>Col F A Bogart, USA<br>(Capt R R Campbell, USN)* | 405 |
| Deputy,<br>H L Finn, Jr. | 410 |

#### DCASR DETROIT

1580 E. Grand Blvd, Detroit, Michigan 48211
Telephone: 923-0100 Area Code: 313

| | |
|---|---|
| Commander,<br>Col W B Dudley, USAF | 201 |
| Deputy,<br>E Richter | 203 |

#### DCASR ST. LOUIS

1136 Washington Avenue, St. Louis, Mo. 63101
Telephone: AM8-1000 + Ext. Area Code: 314

| | |
|---|---|
| Commander,<br>Capt R S Sullivan, USN | 6210 |
| Deputy,<br>E S Crawford | 6211 |

#### DCASR CHICAGO

O'Hare International Airport
P.O. Box 66475, Chicago, Ill., 60666
Telephone: 694-3031 Area Code: 312

| | |
|---|---|
| Commander,<br>Capt R A Schauffler, USN | 2360 |
| Deputy,<br>P Giannini | 2361 |

#### DCASR LOS ANGELES

11099 S. La Cienega Blvd
Los Angeles, Calif. 90045
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| | |
|---|---|
| Commander,<br>Brig Gen A E Exon, USAF | 0230 |
| Deputy,<br>R H Thompson | 0554 |

#### DCASR SAN FRANCISCO

866 Malcolm Road, Burlingame, Calif. 94010
Telephone: 692-0300 Area Code: 415

| | |
|---|---|
| Commander,<br>Col W K Ashby, USAF | 201 |
| Deputy,<br>H E Gardner | 204 |

#### DCASR CLEVELAND

Federal Office Building
1240 East 9th Street, Cleveland, Ohio 44199
Telephone: 522 + Ext. Area Code: 216

| | |
|---|---|
| Commander,<br>Col O G Miller, USA | 5100 |
| Deputy,<br>W E Tisdall | 5103 |

#### DCASR NEW YORK

60 Hudson Street, New York, N.Y. 10013
Telephone: 264 + Ext. Area Code: 212

| | |
|---|---|
| Commander,<br>Brig Gen C H Phipps, USA | 0900 |
| Deputy,<br>P J Coughter | 0901 |

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*Expected to assume office as of February 1, 1969.

# Item Management in the Defense Supply Agency

The Defense Supply Agency is the logical result of an evolutionary process by which the Defense Department has applied the concept of integrated management in the area of common support of supplies and services.

"Single Manager" agencies established within the Military Departments, at the direction of the Secretary of Defense, starting in 1955, reduced supply inventories and operating costs, while maintaining effective support of the Army, Navy, Air Force and Marine Corps.

After a survey of their accomplishments and the possible extension of integrated management into other areas, conducted by the Office of the Secretary of Defense and the Military Departments in 1961, the Secretary of Defense announced on Aug. 31, 1961, that the Defense Supply Agency (DSA) would be established to manage the procurement and distribution of common supplies and to perform related services.

DSA is the consolidated wholesaler for assigned items of supply, and distributes from the depot level in the United States. It supports Air Force and Army installations world-wide. The Military Services determine gross requirements and, with the Joint Chiefs of Staff, establish priorities. DSA computes net requirements, procures supplies from commercial sources, and sells to the Services at cost plus surcharge for transportation. Reimbursement from customers replenishes the DSA Stock Fund. It is this fund which provides the working capital for DSA procurement actions.

Material mission assignments are made to DSA by the Office of the Secretary of Defense (Installations and Logistics) [(OASD (I&L)] on Federal Supply Class (FSC) basis within defined commodity groupings. These commodity groupings are medical, subsistence, clothing, electronics, construction, industrial, chemical and general supplies. In the medical, subsistence and clothing commodities, all items in the attendent classes are assigned to DSA for integrated management. In the remaining commodities, items are selected for assignment to integrated management by DSA through a process known as Item Management Coding.

Item Management Coding (IMC) is a process by which all items, having been assigned Federal Stock Numbers and classified in DSA-assigned classes, must be reviewed against criteria established by OASD (I&L) for determination as to whether the individual items will be retained for Service management by the Service introducing the item, or will be subject to integrated management by DSA. From 1962 to 1964, item management coding was performed under a rather general criteria which resulted in a high percentage of items in DSA-assigned classes remaining under Military Service management.

In March 1964, OASD(I&L) established a study by DSA and the Military Services to identify problems associated with the interpretation and application of existing criteria, and the development of a more definitive set of criteria capable of uniform application by all DOD coding activities. This study was completed in November 1964, and the new criteria were approved by the Defense Materiel Council in April 1965. The revised criteria provided that major end items, depot repairables, design/engineering/source controlled items be retained for Service management, and that standard repair parts and consumable type secondary items be assigned for integrated management by DSA.

With the approval and promulgation of the new criteria, OASD(I&L) directed application to all items which had been previously coded for Service management, as well as to all new items entering the DOD system in DSA-assigned FSCs. This review and application of the new criteria became known as the Retroactive IMC Program.

The Retroactive IMC Program was scheduled to begin July 1, 1965, and to be completed Dec. 31, 1967, and included the review of 975,000 items. The result was that 535,000 items were coded for integrated management by DSA. At the close of FY 1968, the DSA integrated management package totaled 1,964,200 items, approximately 80 percent of the total items in the 286 DSA-assigned classes. In addition, there has been an average of approximately 60,000 new items per year introduced into the DOD system by the Military Services and coded by DSA management, plus approximately 60,000 new items as a result of provisioning. This is considered normal item growth under present conditions.

While the new item growth continues, a companion program, the Inactive Item Review Program, is in effect which influences the DSA item management package and tends to maintain it relatively stable. Under the procedures of this program, all items which have been managed by DSA for a period of 21 months as a result of IMC or for 36 months as a result of provisioning, without a demand, are referred to the using Service for review, pursuant to elimination of the items as no longer required to support Military Services' programs. It is anticipated that this program will result in the elimination of 100,000 plus items annually from DSA management during the next several years.

The method of management varies with commodities and among specific items. Basic policy is to apply management techniques which will be responsive to requirements of the Military Services under the Uniform Materiel Movement and Issue Priority Systems, with maximum efficiency and economy. The methods of management applied to DSA-managed items range from those which are centrally procured, stocked and issued; to those which are procured centrally for direct delivery to customers; and to those which are designated for local purchase by the requiring activity. Criteria have been established for use by the Defense Supply Centers in determination of the appropriate method of management to be applied to items under their management.

The concept of integrated management of common supplies by DSA continues to progress and is recognized as an efficient management concept in military supply logistics.

# BIBLIOGRAPHY

## Research Reports

Organizations registered for service may obtain microfiche copies of these documents without charge from:

Defense Documentation Center
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**Human Factors/Biomedical Safety Considerations for Neodymium Lasers,** Air Proving Ground Center, Eglin AFB, Fla., June 1968, 26 p. Order No. AD–671 993.

**Frequency-Shift Keying Laser Communication Studies.** Army Electronics Command, Fort Monmouth, N.J., April 1968, 144 p. Order No. AD–671 596.

**The Arc Heater Thermal Jet Engine.** Office of Aerospace Research, Holloman AFB, N.M., March 1968, 78 p. Order No. AD–671 501.

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# Work Breakdown Structures for Defense Materiel Items

**E. J. Nucci**
**A. L. Jackson, Jr.**

The concept of using a work breakdown structure (WBS) in project planning and control is not new. In fact, WBS has been used extensively as a management tool by the Defense Department and its industrial contractors in developing and acquiring military systems and equipment for some time.

In essence, a WBS effort focuses on systematically dividing the total job at hand into manageable pieces, which together constitute some total product desired. This is a normal, logical approach to any problem or project, especially one that is large or complex.

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Experience with this tool revealed, however, that the principal managers in a project—development, production, financial, procurement, logistics, etc. (often called "functional managers")—were tailoring breakdown structures to their own individual functional needs. From this there emerged a recognition of the desirability, even necessity, for a WBS system that would provide for a specific contract/project a single WBS that could serve as a common framework for all the functional managers without disturbing their individual needs. Accordingly, a new, unifying dimension of the concept was added by DOD Directive 5010.20, "Work Breakdown Structures for Defense Materiel Items," dated July 31, 1968.

This article is a review of the background events leading up to the need for such a policy directive, and the purposes and relationships of the WBSs in the areas of system/project management, systems engineering, configuration management, integrated logistic support, procurement, and cost and information reporting.

## What is WBS?

As the term implies WBS is a technique for breaking down a total job into its component elements, which then can be displayed in a manner to show the relationship of these elements to each other and to the whole. The WBS display is much like the familiar organization charts used to show the complete structure of a large firm, its organizational sub-elements and their interrelationships. In the context of a system/project, WBS provides a schematic portrayal of the products (hardware, software, services, and other work tasks) that completely defines the system/project. This structure results from the project engineering effort during development and production of the given system/project.

## Background

In the past decade the development and production of military systems and support equipment have been characterized by an increasing trend toward greater functional complexity and a demand for higher readiness capability. The attendant problems led functional managers to develop new techniques and methods aimed at improving technical and management control of programs and projects. Many of these techniques, *e.g.*, cost reporting, configuration management, specification tree, contract line item structure, PERT/Cost, employed a form or structure similar to those used in WBS.

There was a valid need for these and other techniques, and benefits to be gained from their use. Basically, however, they were developed independently and were applied as separate requirements in contracts. Thus, a single contract often contained several different, unrelated breakdown structures in addition to the basic WBS.

Under these circumstances, an opportunity was seen to improve overall project management by providing functional managers with a common reference base for communicating and making decisions of mutual interest. Accordingly, the principals concerned with research and development, financial management, and procurement/production in the Office of the Secretary of Defense agreed on the desirability of a uniform WBS that would satisfy all management functions, and on the need to determine whether or not existing practices were causing special problems. In August 1965 the Director of Defense Research and Engineering initiated a study to analyze existing WBS practices and requirements, which had the following basic objectives:

- To develop guidelines for the preparation and application of a WBS for a single project that would satisfy multiple user needs in DOD and industry, as regards both management planning and control within a project and external information reporting.
- To develop a practical minimum of uniform WBSs that could be applied to the widest possible variety of both large and small system/projects.

As part of the study, WBSs of some 70 different system/projects were analyzed. From the study and other experiences, a set of problems were identified as relating to existing practices:

**Misunderstandings and Confusion Caused by WBS Practices.** The variations and inconsistencies in how the various DOD agencies were applying WBSs in contracts (with differing element definitions, varying structural arrangements, etc.) caused confusion and delay both for DOD and contractors. They were particularly burdensome for the large number of contractors that did business with more than one DOD customer.

**Inability To Evaluate Comparable Efforts.** It was difficult to compare and evaluate planned work efforts and products in competitive proposals owing to the lack of uniform terminology and definitions of scope of WBS elements. Similarly, the comparability of efforts between similar systems/projects was difficult to determine. Also, as a corollary, it was hard to transfer experience gained on one program to a similar follow-on program.

**Inability To Evaluate Completeness of Project.** Project managers were having difficulty in determining the completeness of the project work when they did not have a checklist of all the work to be considered in the system design and management.

**Burden on Contractors of Overlapping Management Reporting Requirements.** Where contracts included several (up to seven) unrelated breakdown structures (to satisfy different management control and reporting requirements), contractors were having to reorient and regroup their management data and control systems. Often they had to establish redundant data collection and reporting procedures which were not related to the way the work was being accomplished.

**Constraints on Design and Development.** WBSs were causing constraints on the design and development process, as well as on project management, in those cases where they were being included in contracts at too low a level of detail.

To begin to find a solution to these problems, the study recommended a set of policies and guidelines for the structuring and application of WBSs in projects for systems and major equipments. A draft DOD directive on WBS policies was proposed, along with a draft military standard for applying these policies in contracts.

The suitability of WBSs prepared and used in accordance with the criteria set forth in these preliminary documents was then demonstrated by a pilot test in which they were applied and analyzed in relation to three different major system developments. Further, these documents were reviewed, and an unusual degree of concurrence was achieved as to their need throughout DOD and industry. When reviewed as part of the DOD/CODSIA[1] study of management systems control, three task groups validated their need and specifically endorsed the proposed product-oriented type WBS.

Finally, the two documents served as the basis for DOD efforts to develop DOD Directive 5010.20, "Work Breakdown Structures for Defense Materiel Items," and the MIL-STD-881 (same title) which was coordinated with industry through CODSIA before publication.

## Gains Expected from New Policy Guidance

Both DOD and industrial contractors should benefit from the new policy guidance on WBS, because it was developed to solve and prevent the recurrence of mutual problems that have arisen in current programs. The following benefits are envisaged:

- Contractors will not be burdened with several unrelated breakdown structures in a single contract, let alone the unwarranted differing WBS requirements from their many DOD customers.
- Ability to compare similar work efforts will be improved, and experience will be transferable to similar new programs.
- The total project's visibility to management will be increased, and all management information will stem from a single framework related to how the work is accomplished.
- The cost of satisfying management's information needs for new programs will be reduced.
- Managers will operate at levels necessary to assure program success and yet preserve the flexibility needed in design, development and production for achieving the desired product.
- Improved defense systems will be acquired at a lower total cost.

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[1] *DOD/CODSIA (Council of Defense and Space Industries Association) Advisory Committee for Management Systems Control, Final Report "Management Systems Control," dated March 1968.*

CATEGORIES OF DEFENSE MATERIEL ITEMS

**AIRCRAFT**

Level 1 AIRCRAFT SYSTEM
- Level 2 AIR VEHICLE
  - Level 3 Airframe
  - Power Plant
  - Other Propulsion
  - Communications
  - Navigation/Guidance
  - Fire Control
  - Penetration Aids
  - Reconnaissance Equipment
  - Automatic Flight Control
  - Anti-Submarine Warfare Equipment
  - Central Integrated Checkout
  - Armament
  - Weapons Delivery Equipment
  - Auxiliary Electronics Equipment
- Level 2 PECULIAR SUPPORT EQUIPMENT
  - Level 3 Organizational/Intermediate
  - Depot
- COMMON SUPPORT EQUIPMENT
  - Organizational/Intermediate
  - Depot
- SYSTEMS TEST & EVALUATION
  - Development Tests
  - Technical Evaluation
  - Operational Evaluation
  - Test & Evaluation Support
  - Mock-Ups
  - Test Facilities

**MISSILES**

Level 1 MISSILE SYSTEM
- Level 2 AIR VEHICLE
  - Level 3 Integration & Assembly
  - Propulsion (For Single Stage Only)
  - Stage I
  - Stage II
  - Stage III
  - Stage IV
  - Guidance and Control
  - Launched Payload
  - Payload Shroud
  - Airborne Test or Training Equipment
  - Auxiliary Equipment
- COMMAND & LAUNCH EQUIPMENT
  - Integration & Assembly
  - Surveillance, Identification and Tracking Sensors
  - Data Processing
  - Launch and Guidance Control
  - Launcher Equipment
  - Communications
  - Auxiliary Equipment

See (A) above for additional required elements.

**SPACE**

Level 1 SPACE SYSTEM
- Level 2 SPACE VEHICLE
  - Level 3 Integration & Assembly
  - Spacecraft
  - Propulsion Module
  - Payload
  - Payload Shroud
  - Re-entry Vehicle
  - Orbit Injection/Dispenser
- LAUNCH/STAGE VEHICLE
  - Integration & Assembly
  - Stage I
  - Stage II
  - Stage III
  - Stage IV
  - Guidance and Control
- GROUND COMMUNICATIONS, COMMAND AND CONTROL EQUIPMENT (PECULIAR)
  - Surveillance, Identification and Tracking Sensors
  - Communications
  - Command and Control
  - Data Processing Equipment
  - Launch Equipment
  - Auxiliary Equipment
- FLIGHT SUPPORT OPERATIONS AND SERVICES
  - Launch Operations and Services
  - Flight Operations and Services
  - Recovery Operations and Services

**SHIPS**

Level 1 SHIP SYSTEM
- Level 2 SHIP
  - Level 3 Hull Structure
  - Propulsion
  - Electric Plant
  - Communication and Control
  - Auxiliary Systems
  - Outfit and Furnishings
  - Armament
  - Integration Engineering
  - Ship Assembly

See (A) above for additional required elements.

**SURFACE VEHICLES**

Level 1 SURFACE VEHICLE SYSTEM
- Level 2 PRIMARY VEHICLE
  - Level 3 Integration and Assembly
  - Hull/Frame
  - Suspension/Steering
  - Power Package/Drive Train
  - Auxiliary Automotive Systems
  - Turret Assembly
  - Armament
  - Body/Cab
  - Special Equipment
  - Communications and Navigation Equipment
- SECONDARY VEHICLE
  - (Same as Primary Vehicle)

See (A) above for additional required elements.

**ELECTRONICS**

Level 1 ELECTRONICS SYSTEM*
- Level 2 PRIME MISSION PRODUCT(S)
  - Level 3 Integration and Assembly
  - Sensors
  - Communications
  - Automatic Data Processing Equipment
  - Computer Programs
  - Data Displays
  - Auxiliary Equipment
- *VEHICLE/SITE/PLATFORM
  - Select Level 2 and Level 3 from other Categories

*For electronic systems vehicle or platform can be any one of the Level 2 vehicles for the other categories.

See (A) above for additional required elements.

**ORDNANCE**

Level 1 ORDNANCE SYSTEM
- Level 2 LAUNCH SYSTEM
  - Level 3 Integration and Assembly
  - Launcher
  - Carriage
  - Fire Control
  - Ready Magazine(s)
  - Adaptor Kits
- COMPLETE ROUND
  - Integration and Assembly
  - Structure
  - Warhead
  - Fuze
  - Safety/Arm
  - Guidance and Control
  - Propellant/Propulsion

See (A) above for additional required elements.

Figure 1.

**FOR CATEGORIES OF DEFENSE MATERIEL ITEMS**

Ⓐ **APPLICABLE TO ALL CATEGORIES (Select as appropriate).**

SYSTEM/PROJECT MANAGEMENT
- System Engineering Management/
  System Engineering
- Supporting Project Management
  Activities

TRAINING
- Equipment
- Services
- Facilities

DATA
- Technical Orders & Manuals
- Engineering Data
- Management Data
- Data Depository

OPERATIONAL/SITE ACTIVATION
- Site Construction,
- System Assembly, Installation &
  Checkout on Site
- Site/Ship/Vehicle Conversion
- Contractor Technical Support

INDUSTRIAL FACILITIES
- Construction/Conversion/Expansion
- Equipment Acquisition or
  Modernization
- Maintenance

SPARES & REPAIR PARTS
- Specify by Hardware Element

See Ⓐ above for additional required elements.

NOTES: 1. Other Level 2&3 elements may be added if necessary (See DOD Directive 5010.20)
2. See MIL-STD- 881 for detailed definition of WBS elements

## Application of WBSs

Since management control and project element visibility are the principal objectives of WBS, its greatest value is realized when it is applied to large, complex projects. For this reason, the DOD directive requires that the WBS concept be applied to all new major defense systems and equipments (or major modifications) in engineering development or in operational systems development,[2] and to the production following these development projects. However, the application of a WBS, wholly or in part, may be directed by the responsible DOD agency or by the Director of Defense Research and Engineering to other systems or equipments in engineering development, operational systems development, or follow-on production.

## How are WBSs Prepared?

Before pursuing this discussion further, it is important to understand the basic construction of the four principal WBSs that are applicable:

- Summary WBS.
- Project Summary WBS.
- Contract WBS.
- Project WBS.

Each of these structures is composed of a set of *elements* that make up an identifiable product, a set of data, or a collection of services.

**Summary WBS.** The set of *generalized* structures (shown in Figure 1) are the Summary WBSs for the seven principal categories of defense materiel system/projects—aircraft, missiles, space, ships, surface vehicles, electronics and ordnance. While a complete WBS is the entire "family tree" down to the required level of detail, a Summary WBS relates only to the upper three levels of that "tree." These top levels are prescribed in MIL-STD-881 as to element terminology, definition and placement in the "tree" structure.

**Project Summary WBS.** This type of WBS is a *tailored* one, prepared by the customer, the DOD component (Army, Navy, Air Force or Defense Agency), by selecting elements applicable to a particular project from one or more of the Summary WBSs shown in Figure 1 to match the project's objectives. Where elements of the Summary WBS are insufficient because of a unique configuration or other special features of the project, additional or substitute WBS elements may be used to make up a Project Summary WBS. Also, items known to be critical to the project may be included as elements in the summary levels or in any lower level as needed.

As shown in Figure 2 (page 26), the first structure in a project is ordinarily a *preliminary* Project Summary WBS developed from the results of the preliminary systems engineering conducted during concept formulation[3] or equivalent effort. The *preliminary* Project Summary WBS is an input and a basis for contract definition[4] or equivalent effort; changes, if any, in the WBSs resulting from this effort are adopted to establish the *approved* Project Summary WBS.

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[2] *Engineering development and operational systems development are development efforts wherein the hardware is engineered for service use (DOD Directive 3200.6).*

[3] *Concept Formulation. The comprehensive system studies and experimental hardware efforts necessary to provide the technical, economic and military bases for a conditional decision to initiate engineering development (DOD Directive 3200.9).*

Contract WBS. Appropriate elements selected from the approved Project Summary WBS are then compiled and used in the Requests for Proposal (RFPs) for the various follow-on development efforts. Necessary adjustments may be made on the basis of contractors' proposals and contract negotiations. During the contract work, the development contractor(s)—or an equivalent in-house activity—by breaking the job into smaller pieces extend the WBS elements negotiated into the contracts, and so develop the Contract WBSs which contain the additional levels necessary to the individual contract effort. The Contract WBS thus portrays all products and work to be accomplished under a specific contract. Note that the elements in the lower WBS levels are defined by the contractor.

Project WBS. The Project WBS, which the DOD component prepares before production, is developed by merging the various Contract WBSs with the Project Summary WBS. Changes to the WBS made during the production will be reflected in the Contract WBS and the Project WBS.

MIL–STD–881 contains the guidance needed to prepare and apply WBSs during the various phases of systems acquisition.

## How Is WBS Used?

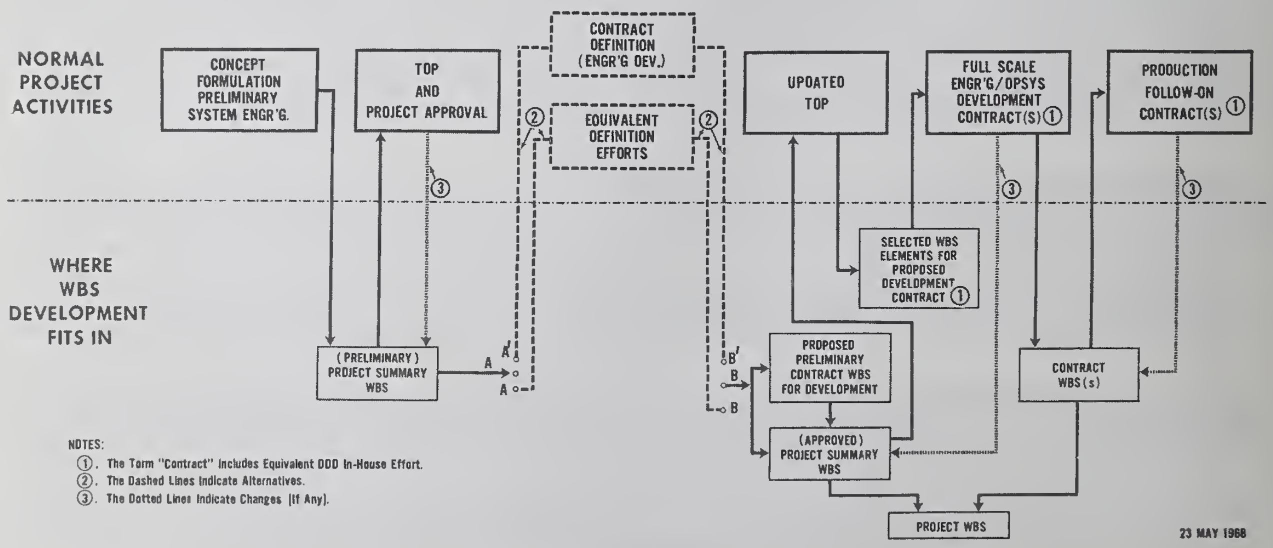
WBS provides project managers and other interested parties, on a continuing basis, with a visible framework and display of all products and services comprising the entire work effort related to a specific project. It is used as a common base for controlling and reporting the progress and status of engineering efforts, resource allocations, cost estimates, expenditures, and procurement actions throughout development and production. In summary, WBS is used as a common framework to satisfy the needs of the various functional managers—technical, financial, procurement/production, and logistics—involved in a project. These uses are detailed more specifically in the following paragraphs which relate WBS to several important activities pursued in the course of a project.

### System/Project Management.

This is the area in which WBS has the greatest use or variety of purpose, because the system/project manager is concerned with all principal areas of management. Since WBS portrays the products and services comprising all work related to the project, the system/project manager uses WBS first to review and assure the completeness of systems engineering in terms of hardware, software, facilities and systems support. Once this breakdown is established, the evolving WBS is used in planning and assigning responsibilities and schedules for accomplishment of the work, including the activities and efforts of interface support groups. The same framework also provides a basis for planning "in-house" and contract efforts, and for allocating resources.

Since the breakdown results from the systems engineering (which reflects the performance allocated to the components of the system/project), WBS provides an excellent framework for monitoring performance, cost and schedule throughout the program. As an allied benefit, the WBS display is a convenient method of highlighting critical items or areas of

**DEVELOPMENT AND RELATIONSHIPS OF WBS(s) DURING ACQUISITION**


NORMAL PROJECT ACTIVITIES
WHERE WBS DEVELOPMENT FITS IN
CONCEPT FORMULATION PRELIMINARY SYSTEM ENGR'G.
TOP AND PROJECT APPROVAL
CONTRACT DEFINITION (ENGR'G DEV.)
EQUIVALENT DEFINITION EFFORTS
UPDATED TOP
FULL SCALE ENGR'G/OPSYS DEVELOPMENT CONTRACT(S) ①
PRODUCTION FOLLOW-ON CONTRACT(S) ①
②
②
③
③
③
SELECTED WBS ELEMENTS FOR PROPOSED DEVELOPMENT CONTRACT ①
(PRELIMINARY) PROJECT SUMMARY WBS
A
A'
A
B'
B
B
PROPOSED PRELIMINARY CONTRACT WBS FOR DEVELOPMENT
(APPROVED) PROJECT SUMMARY WBS
CONTRACT WBS(s)
PROJECT WBS

NOTES:
①. The Term "Contract" Includes Equivalent DOD In-House Effort.
②. The Dashed Lines Indicate Alternatives.
③. The Dotted Lines Indicate Changes (If Any).

23 MAY 1968

Figure 2.

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[4] *Contract Definition. The initial phase of engineering development to verify or accomplish preliminary design and engineering, develop the necessary performance specifications and management plan to form the basis of a firm contract for the full-scale engineering development (DOD Directive 3200.9).*

the project to ensure that they receive the necessary attention by management.

The preliminary Project Summary WBS is submitted as part of the system/project Technical Development Plan and will be evaluated as part of the project approval process. Further, the System/Project Master Plan will include the Project Summary WBS.

It is significant that, while the detailed levels of WBS are always to be available to the system/project manager, DOD management control (aside from critical items) is established through the summary levels of WBS. This provides for adequate management control while retaining contractor flexibility in accomplishing the work (a factor discussed later in connection with cost and management information reporting).

**Systems Engineering.**

WBS provides a visible documentation of the results and status of systems engineering at any point in time. It has the following uses:

- As a vehicle to summarize all products and services comprising the project's total engineering effort (including the necessary support and other tasks), and to display the relationship of these component efforts to each other and to the whole engineering activity.
- As a tool in reviewing the completeness of the total project engineering effort.
- As a means of highlighting critical items of the project.
- As a framework for developing the system/project "specification tree" needed to describe the configuration base lines.
- As the common framework and basis for monitoring technical performance, cost and schedule; and for making it possible to trace requirements and functions to the hardware.
- As a means of communicating the results of systems engineering to subsequent phases of the acquisition process.

When used as in the last item, the various WBSs are intended to evolve with the project engineering and not steer it. WBS is not to be allowed to interfere with the flexibility needed by the development or production agency to achieve the desired product. Accordingly, the preliminary Project Summary WBS (Figure 2) should be viewed simply as a means of communicating to the contract definition contractor the results of preliminary systems engineering during concept formulation. In no way should this WBS constrain the system definition process. In fact, contractors are encouraged to propose alternative solutions aimed at obtaining an improved product.

Similarly, summary levels of a WBS selected for use in the Request for Proposal in engineering development and operational systems development should be reviewed and adjusted so as to be compatible with the bidder's proposed efforts, provided that they remain consistent with project needs. Aside from government-furnished equipment and specified critical WBS elements negotiated into the contract work statement, the contractor must have complete flexibility in extending WBS to show how his work is to be done, and thus complete the Contract WBS.

**Configuration Management.**

As a framework portraying the products and services comprising the system/project at any point in time, WBS also reflects the configuration breakdown. Through the function of configuration management, these same products are described, their physical and functional characteristics being controlled in a set of specifications and other descriptive technical documents. This composite array of specifications forms the specification tree of the system/project, which is directly related to WBS.

Another notable correlation is that all items identified in contracts as "configuration items,"[5] those subject to configuration management, are elements in the Project Summary and Contract WBSs. On the other hand, all WBS elements are not necessarily subject to configuration management. A Contract WBS, therefore, includes at least as many levels of WBS as are necessary to identify all configuration items.

**Integrated Logistic Support (ILS).**

In view of recently increased management attention to ILS, the WBS concept provides another mechanism by which the consideration of support requirements for system/project engineering can be assured. Accordingly, the elements needed to satisfy logistic management requirements—support equipment, facilities, repair parts, etc. —are included in the Summary WBS (Figure 1) for use in the Project Summary WBS. Below the Summary WBS levels, there may be situations in which logistics management and reporting can best be accomplished by utilizing some identifiable combination of elements related to those of the Project Summary WBS.

**Procurement/Production.**

The deliverable output of a contract consists of products and services, and WBS elements are established in those terms. Because of this congruity, WBS can be used as a convenient means of relating the products and services of a procurement to the natural breakdown dictated by the project's systems engineering. The Project Summary WBS can be used to formulate work statements and establish the contract line items or end items. Government-furnished equipment is also directly related to the Contract WBS. The product orientation of WBS also makes it possible to relate all contractually required technical and management reports to the Project Summary and Contract WBSs. Further, this same framework can be used for monitoring contract compliance in terms of technical performance, cost and delivery schedules. In addition, the technical data packages deliverable under the contract can be related to the summary levels of the Contract WBS.

While the foregoing contractual aspects are related to WBS, a one-to-one correlation is not necessarily required. The contract negotiator may find that the best contractual arrangement and the best contract price may be obtained by combining certain WBS elements. The contract negotiator must be free to work on the basis of a contract structure that will help him achieve a contract that has favorable terms for both the Government and its contractor. However, this latitude must not be allowed to compromise the effectiveness of the contracted work, or system performance, which are the prime factors determining the system's ultimate real value to the Government. The contract line items, end items, or work-statement tasks, therefore, should be either WBS elements or some identifiable combination of WBS elements related to the Project Summary WBS.

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[5] *See DOD Directive 5010.19, "Configuration Management."*

Consequently, WBS serves to integrate the work effort and procurement details. Only one WBS is established and used from the issuance of each Request for Proposal throughout the ensuing contract.

**Cost and Management Information Reporting.**

Since the reporting of management information is related to hardware and services, WBS again provides a natural vehicle for this reporting. Establishing these reporting requirements on the framework of WBS means that managers can use the same data that were generated in the engineering and work process. The organization of reporting requirements before the WBS approved for the project has been developed, however, is not to be construed by either Government or contractor as determining how the system or equipment is to be designed and built.

The fact that WBSs relating to various weapon and support systems represent a uniform basis for collecting cost data makes it possible to compare the cost of like weapons and equipments, and to better estimate the cost of similar future programs. The success of these cost comparisons, however, will depend largely on ability to uniformly apply accurate definitions of the scope of WBS elements. This is one objective of the WBS-element definitions established and required by MIL–STD–881.

With respect to schedule monitoring and reporting, WBS again provides a common framework which permits the use of engineering management information for business management.

WBS also provides a discrete mechanism for implementing the basic principle that all management and cost reporting must be restricted to as high a level as is practical for assuring the program's success, while retaining flexibility of operation. Only summarized data is required to monitor the contractor's progress, but relevant detail is to be available if the need arises. In WBS, this relates to the summary levels and to critical items at lower levels. Thus the contractor has complete freedom and flexibility in his own internal management, and the amount of reporting is reduced.

### WBS: A Tool for Top Management

The top managers of both DOD and defense contractors need adequate continual visibility of entire projects, with timely knowledge of project performance. They also need timely data on the occurrence of problems and the cause of these problems. In fact, what is needed is a means for detecting or predicting these problems much earlier than it has been done in the past.

In WBS, management visibility and data reporting are established in a fashion which is directly related to the systems engineering and the manner in which is the work is to be accomplished. Accordingly, WBS is viewed as a necessary tool for helping to satisfy these top management needs. The payoff to this improved management approach will be the improvement of DOD's ability to achieve the operational performance and readiness it needs at the lowest possible cost.

## Navy Engineers Study Undersea Windows

Naval scientists have discovered a way to increase the visibility of deep sea submersibles by improving the design of the craft's windows.

In the past, windows on submersibles have been very small because of the lack of knowledge about the resistance of various transparent materials to pressure and the effects of window shape.

Tests at the Naval Civil Engineering Laboratory, Port Hueneme, Calif., however, reveal that windows can be greatly enlarged and retain their strength if made of acrylic plastic and constructed in a curved shape.

Curved acrylic plastic windows have been subjected to simulated dives of five minutes duration at pressures equal to those at an ocean depth of 3,400 feet and have given no evidence of failure.

The largest window tested to date measured 38 inches in diameter and four inches thick.

Test of the new window design are being conducted in the laboratory's hydrostatic pressure vessel which simulates various ocean depths by having seawater pumped in from the nearby ocean to build up pressures.

## AF Develops Mobile Electronic Aircraft Scale

Aircraft weighing operations in forward combat areas in Southeast Asia have been greatly eased by the use of a new mobile electronic weighing system (MEWS).

Developed by Air Force Systems Command's Aeronautical Systems Division, at Wright-Patterson AFB, Ohio, the new system now makes it possible for aircraft to be weighed outdoors on a ramp surface on platform scales instead of the customary jacking operations inside a hangar.

The units first were used at Tan Son Nhut, Cam Ranh Bay and Da Nang air bases, according to project engineer Joseph D. Hooker, who accompanied the ground support equipment to Vietnam along with project manager, Captain V. T. Kelty Jr.

The system weighs 6,000 pounds and is mounted on a four-wheeled trailer. Each system includes eight portable electronic platform scales, 12 vehicle ramps, eight aircraft ramps and spacers for tandem axles for vehicle and aircraft.

Also included is a 24-foot specially-designed conveyor section capable of supporting single, double, or triple palletized loads of 10,000 pounds per pallet, or 30,000 pounds per triple palletized cargo loads.

MEWS also includes an electronic computing and indicating instrument which enables cargo handlers to compute automatically, for the first time, the center of gravity for multiple pallet loads.

## Army Engineers Seek Improved Landing Mats

U.S. Army Engineers have launched a new research and development program to provide lighter, stronger and more economical prefabricated airfield landing mats for light, medium and heavy duty use.

Contracts are being negotiated with several firms to provide mats in each of three classifications for engineer traffic tests to be performed using aircraft wheel loads.

The Army will evaluate several new design concepts, including a nonmetallic mat and an aluminum mat with an extruded foam core.

# ABOUT PEOPLE

## DEPARTMENT OF DEFENSE

**Brig. Gen, Frank K. Everest Jr.**, USAF, has been named Asst. Dir. (Operational Test & Evalution), Office of the Dir. of Defense Research & Engineering.

**Col. George A. Zacharias**, USA, is the new Chief of the Office of Industrial Security, Defense Contract Administration Services, Defense Supply Agency.

## DEPARTMENT OF THE ARMY

**Maj. Gen. Leo H. Schweiter** has succeeded **Maj. Gen. William A. Becker** as Dep. Commanding General, Army Combat Developments Command, Fort Belvoir, Va. Gen. Becker will serve as the Army's new Chief of Legislative Liaison. **Maj. Gen. Osmund A. Leahy** will take over as Acting Dep. Commanding General and Chief of Staff until Gen. Schweiter reports aboard. Gen. Leahy will then take command of the Institute of Land Combat, Fort Belvoir, Va. **Brig. Gen. Robert E. Conner** will serve as the new Chief of Staff, Combat Developments Command.

**Col. Nicholas G. Bottiglieri** has reported for duty as Commanding Officer and Director, Army Medical Research Unit-Presidio, and Chief, Dept. of Research & Development, Letterman General Hospital, San Francisco, Calif.

**Col. William Mulheron Jr.** has taken command of the Army Arsenal at Watervliet, N.Y., the Army's heavy weapons design and development center.

**Lt. Col. Peter E. Hexner** has succeeded **Col. Leslie G. Callahan Jr.**, as Commander, Harry Diamond Laboratories, Washington, D.C.

**Lt .Col. Edward M. Ridlehoover** has been named Chief of the Army Missile Command's Future Missile Systems Div., at Redstone Arsenal, Ala.

## DEPARTMENT OF THE NAVY

**Capt. H.E. Nichols**, SC, is the new Supply Officer at the Naval Air Engineering Center, Philadelphia, Pa. He comes to the new post from duty as Staff Supply Officer for Commander, Military Sea Transportation Service, Atlantic, headquartered in Brooklyn, N.Y.

## DEPARTMENT OF THE AIR FORCE

**Dr. Hans-Georg** Clamann has been selected to succeed **Dr. Hubertus Strughold** as the Chief Scientiest of the Aerospace Medical Div., Air Force Systems Command, headquartered at Brooks AFB, Tex. Dr. Strughold has retired after more than 21 years work in aerospace medicine with the U.S. Air Force.

**Dr. Stephen W. Tsai** has been named Chief Scientist of the Air Force Materials Laboratory, Wright-Patterson AFB, Ohio.

The Air Force Systems Command (AFSC) has also made the following assignments of key positions:

**Col. Waldo E. Bertoni**, Dep. Systems Program Dir., Sentinel Foam, Electronic Systems Div., L.G. Hanscom Field, Mass.; **Col. James S. Carson**, Chief, Air Force Weapons Effectiveness Test Div., Armament Development and Test Center, Elgin AFB Fla., **Col. Howard M. Estes Jr.**, Commander/Dir., Air Force Rocket Propulsion Laboratory, Edwards AFB, Calif.

Other changes at AFSC include:

**Col. Charles A. Laustrup**, Chief, Air Force Contracts Management Office for the Space & Missile Systems Organization, Los Angeles, Calif.; **Col. Joseph F. Marling**, Dir., Combat Systems Program Office, Aeronautical Systems Div., Wright-Patterson AFB, Ohio; **Col. Clement K. Miller**, Vice Commander, Arnold Engineering Development Center, Tenn.; **Col. Tipton P. Mott-Smith**, Dep Dir., Aerospace Propulsion Laboratory, Wright-Patterson AFB, Ohio; **Col. Donald G. Nunn**, Chief of Staff, Space & Missile Systems Organization, Los Angeles, Calif.; **Col. Henry A. Orban**, Asst. Dep. for Subsystems & Equipment Management, Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

Additional AFSC assignments include:

**Col. William Reed**, Dep. Commander, Air Force Armament Laboratory, Eglin AFB, Fla.; **Col. James F. Sullivan**, Dir., Systems Analysis, MOL Program, Space & Missile Systems Organization, Los Angeles, Calif.; **Col. Durwood B. Williams**, System Program Dir., 496L/474N, Electronic Systems Div., L.G. Hanscom Field, Mass.; **Lt. Col. Norman J. Glenn**, Asst. Chief, Flight Operations Div., Directorate of Flight Test, Aeronautical Systems Div., Wright-Patterson AFB, Ohio; and **Lt. Col. Robert L. Makinney**, Dir., Light Intra-theater Transport Aircraft System Program Office, Aeronautical Systems Div. Wright-Patterson AFB, Ohio.

## MTMTS Centralizes Control of Personal Property Moving

Control of worldwide traffic management responsibility for the Defense Department Personal Property Moving and Storage Program has been centralized by the Military Traffic Management and Terminal Service (MTMTS).

Under the realignment, all MTMTS personal property traffic management elements will be placed under the direct supervision and control of Colonel Joseph J. Kennedy, USAF, Director of Personal Property at MTMTS headquarters in Washington, D.C.

Personal property directorates at the MTMTS Eastern and Western Area headquarters will be redesignated the MTMTS Eastern and Western Personal Property Operations Offices and will remain at their present locations in Brooklyn, N.Y., and Oakland, Calif., respectively.

# MEETINGS AND SYMPOSIA

## FEBRUARY

Biennial Navy League Seapower Symposium and Sea-Air-Space Exposition, Feb. 25–27, at the Sheraton Park Hotel, Washington, D. C. Sponsor: Navy League of the United States and D. C. Council of the Navy League. Contact: Dale Shear, Navy League of the United States, 808 18th St., N. W., Washington, D.C. 20006, Phone (202) 298-9282.

## MARCH

Variety in Ship Engineering Technical Symposium, March 28, at the Statler Hilton Hotel, Washington, D.C. Sponsor: Association of Senior Engineers of the Naval Ship Systems Command. Contact: Mr. Jon R. Buck, Association of Senior Engineers, Naval Ship Engineering Center, SEC 6162, Room 4646, Main Navy, Washington, D.C. 20360, Phone (202) OXford 6-5550.

## APRIL

International Symposium on **Global Problems in Analysis**, April 2–4, at Princeton University, Princeton, N.J. Sponsor: Air Force Office of Aerospace Research. Contract: Dr. R. G. Pohrer, Air Force Office of Scientific Research, (SRMM), 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OXford 4-5264.

**Mathematical Aspects of Electrical Network Analysis** Symposium, April 2–5, in New York N.Y. Sponsors: Army Research Office—Durham, Air Force Office of Scientific Research, the American Mathematical Society and the Society for Industrial and Applied Mathematics. Contact: Dr. Gene Parrish, Mathematics Div., Army Research Office—Durham, Box CM, Duke Station, Durham, N.C. 27706, Phone (919) 286-2285 or Maj. Paul J. Daily, Air Force Office of Scientific Research, (SRMA), 1400 Wilson Blvd., Arlington Va. 22209, Phone (202) OXford 4-5261.

**Computer Processing in Communications** Symposium, April 8–10, at the Waldorf-Astoria Hotel, New York, N.Y. Sponsors: Air Force Office of Scientific Research, Office of Naval Research and the Army Research Office. Contact: Lt. Col. Robert B. Kalisch, Air Force Office of Scientific Research, (SREE), 1400 Wilson Blvd., Arlington Va. 22209, Phone (202) OXford 4-5518.

Annual National **Telemetering** Conference and Exposition, April 22–24, at the Washington Hilton Hotel, Washington, D. C. Sponsor: Institute of Electrical and Electronics Engineers Group on Aerospace and Electronic Systems, and Communication Technology. Contact: Robert D. Briskman, General Chairman, COMSAT, 950 L'Enfant Plaza South, S. W., Washington, D. C. 20024, Phone (202) 554-6097.

**Army Numerical Analysis** Conference, April 24–25, at Walter Reed Army Institute of Research, Washington, D.C. Sponsor: Army Research Office—Durham. Contact: Dr. Francis G. Dressel, Mathematics Div., Army Research Office—Durham, Box CM, Duke Station, Durham, N.C. 27706, Phone (919) 286-2285.

## MAY

Twenty-Third Annual **Frequency Control** Symposium, May 6–8, at Atlantic City, N.J. Sponsor: Solid State and Frequency Control Division of the Electronics Components Laboratory, Army Electronics Command. Contact: Dir., Electronic Components Laboratory, Attn: AMSEL–KL–DT (Mr. M. F. Timm), Electronic Components Laboratory, Army Electronics Command, Fort Monmouth, N.J. 07703, Phone (201) 535-2250.

**Biological Research in Malaria** Panel Workshop, May 14-16, at the Walter Reed Army Institute of Research, Washington, D.C. Sponsor: Surgeon General, Department of the Army. Contact: Dr. Elvio H. Sadun, Chief, Department of Medical Zoology, Walter Reed Army Institute of Research, Washington, D.C. 20012, Phone (202) 198-3308.

Twenty-third Annual **Power Sources** Conference, May 20–22, at the Shelburne Hotel, Atlantic City, N.J. Co-sponsors: Army Electronics Command and the Interagency Advanced Power Group. Contact: Galen R. Frysinger, Chief, Power Sources Div., Army Electronics Command, Attn: AMSEL–KL–P, Fort Monmouth, N.J. 07703.

**Anopheline Biology and Malaria Eradication** Meeting, May 21–23, at Washington, D.C.Co-sponsors: Defense Department Armed Forces Pest Control Board and the Forest Glen Section of the Walter Reed Army Medical Center, Contact: Dr. Ronald A. Ward, Asst. Chief, Dept. of Entomology, Div. of Communicable Diseases and Immunization, Walter Reed Army Institute of Research, Room 121, Washington, D.C. 20315, Phone (202) 576-3719.

## Navy Studies Submersibles for Ocean Floor Surveys

Surveys of the ocean floor, much of which has yet to be recorded on marine charts, may be conducted in the future by deep diving vehicles instead of by surface ships according to the U.S. Naval Oceanographic Office.

For the past two years, Navy scientists have been testing various manned submersibles, hoping to design a deep diving vehicle that can be used exclusively for surveying tasks.

Those included in the study were the Alvin, Star III, Deepstar–4000, Cubmarine and Aluminaut.

According to Frank Busby, the chief sceintist studying deep-diving vehicles for the Oceanographic Office, all five submersibles used in the study performed adequately.

In testing the Aluminaut it was found that data obtained by the submersible was more accurate than that gathered by surface survey ships charting the ocean floor.

# Air Force Officers Learn in Industrial Jobs

**Lieutenant Colonel Frank S. Raggio, USAF**

Weapon system development, today, requires extremely close working relationships between military and civilian members of the defense-industry team. The military member must be as knowledgeable about research, development, procurement and production as his industry counterpart.

This need for knowledgeable military officers inspired revitalization of a post-World War II program, then called Training With Industry. As originally conceived, the training was intended to indoctrinate senior Air Force officers (lieutenant colonels and colonels) with a working knowledge of high level management techniques used by major defense industries. No formal course was followed. Instead, the Air Force officers spent their time with senior line and staff executives as they performed their daily tasks. Over the years, there has been little change from this overall concept.

In the current program, now called Education with Industry to emphasize its academic features, 150 to 170 officers, in the middle management levels (lieutenant through lieutenant colonel), are assigned to work with defense contractors for a period of 10 months. The officers may choose among 14 subject areas:

- Advanced photographic technology.
- Armament development.
- Astronautics and space vehicles.
- Automated data communications.
- Civil engineering design.
- Civil engineering construction.
- Civil engineering industrial maintenance.
- Civil engineering, astronautics and space vehicles facilities.
- Industrial planning and procurement.
- Management engineering.
- Management of research.
- Medical industrial planning and procurement.
- Missile range technology.
- Academic administration internship.

Within the 14 subjects, primary areas of study include engineering, manufacturing, operations, personnel, research and development, and sales (especially military). The major emphasis, however, is on management.

When American defense industry provides such a development opportunity, the Air Force Institute of Technology (AFIT), which administers the program, must insure that only the most qualified officers with the greatest potential are nominated to participate. As in all AFIT programs, an interested officer must apply for Education with Industry through education channels. If an officer meets certain necessary qualifications, he is issued a letter of eligibility. Screening, selection and assignment are the next steps, based upon Air Force-wide requirements. Each officer's record is screened by a special board established by Air Force headquarters and Air University, the command which supervises AFIT. The officer must have earned effectiveness performance ratings in the top levels, and must have attained sufficient levels of education. Finally, the company reviews each nominee's record, and accepts or rejects the officer.

Education with Industry programs are intended to improve the officer's career potential, but are not designed with only the next assignment in mind. Rather, the experience is aimed at long-range career development. AFIT intends that each course approximate a company management development program, which the Air Force expects will produce better military resource managers. The whole 10-month program gives each officer a level of knowledge which would normally require many years of employment to obtain.

Each company participating in the Education with Industry program appoints an employee as coordinator. He is the vital link who makes the program a dynamic management and technical learning experience. He establishes the company's program. He guides the officer-students through a broad spectrum of industrial experiences.

Many industry coordinators, drawing upon their experiences in developing industrial training programs, strongly insisted upon receiving specific program information about objectives, progress check points and curricula. AFIT, however, decided that objectives must remain general, that each company program must be as unique as the company. The company coordinator has the freedom to establish a "company" oriented program unencumbered by Air Force dictates.

The overall objective of the Education with Industry program is:

> To develop management qualities and technical leadership abilities in select officers and to provide them with industrial comprehension, and knowledge of methods used in research, development, manufacture, and procurement of Air Force hardware.

The enthusiastic support and cooperation of the participating companies, from top managers to front line supervisors, has helped the Air Force achieve this goal.

About the Author—

Lieutenant Colonel Frank S. Raggio, USAF, is Chief, Continuing Education and Evaluation Division, Air Force Institute of Technology. He has been assigned in the comptroller field and as Professor of Aerospace Studies, Montana State University. He holds a Master of Business Administration degree from The George Washington University.

# Army Studies M551 Vehicle for New Light Armor Battalions

Employment of the new Sheridan Armored Reconnaissance/Airborne Assault Vehicle (M551) by a light armor battalion is being studied by the Army during extensive field tests at Fort Riley, Kan., and Fort Gordon, Ga.

Main purpose of the troop tests, being sponsored by the Army Combat Developments Command (CDC), Fort Belvoir, Va., is to evaluate doctrinal and organizational use of the M551 by a light armor battalion.

The entire package—equipment, doctrine and organization, working interdependently—is the light armor battalion concept. It is expected to be a weapon system that will fully exploit the capabilities of the lightweight (16.5-ton) Sheridan vehicle.

Data on firepower and maintenance of the Sheridan vehicle will shape CDC's final specifications for the new light armor battalion.

The M551 is equipped with the Shillelagh missile as well as its own long range anti-tank knockout punch. During the troop tests, the Sheridan's conventional, but unique, round with the combustible casing is also being studied to determine the effectiveness of the ammunition's weather proofing and safety devices.

A bore Scavenging System, which uses a compressed air blast to flush residue from the firing tube, is another new system which is being evaluated. A compressor kicks in after a couple of rounds have been fired to recharge the compressed air containers.

The platoon firing exercises use stationary and moving targets, engaged by conventional ammunition and the Shillelagh guided missile, both from the M551's 152mm tube. The vehicle's .50 caliber and 7.62mm machine guns also are getting a work-out.

In addition, the Sheridan's various night vision devices (infrared, searchlight and Starlight Scope) are being looked at carefully in night run-throughs. The Starlight Scope is an image-intensifier using existing natural light and has the advantage of being undetectable by enemy troops.

The tests are being directed by Brigadier General Linton S. Boatwright, Commanding General of Fort Riley and of the 24th Infantry Division. Closely supervising the tests is Colonel George E. Kimball, Deputy Test Director, called in especially from the Armor School, Fort Knox, Ky., for the CDC troop test.

SHERIDAN ARMORED ASSAULT vehicle fires a Shillelagh missile from its gun during employment evaluation.

## AF Tests New Thermoelectric Air Conditioners

The Air Force is testing a thermoelectric air conditioner for use in mobile communications vehicles. It is 12 times more reliable than conventional compressed vapor systems.

Developed for the Air Force by Radio Corporation of America's Defense Electronic Products Division, Camden, N.J., the new air conditioners have an estimated time before failure of 6,000 hours, against 480 for vapor units.

Thermoelectric air conditioners operate by passing an electric current through a semiconductor alloy composed of bismuth and tellurium. The electricity results in heat absorption or cooling on one side and heat radiation on the other. When the polarity on the thermoelectric circuit is reversed, the unit acts as a heater.

Officials at the Air Force Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio, which is managing the project, say that a single unit is capable of cooling a four-room apartment to 15 degrees below the outside temperature.

The modules and fans used in the prototype can be applied to any thermoelectric air conditioner, thus enabling the Air Force to develop a family of the units.

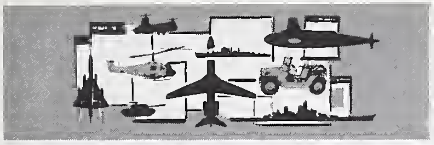
The present prototype is about 15 cubic feet in size and weighs 300 pounds.

## Coast Guard Opens R&D Office

The U.S. Coast Guard has established an Office of Research and Development to meet future requirements in marine science, search and rescue, aids to navigation and marine safety.

Rear Admiral Orvan R. Smeder has been named chief of the new organization and Dr. Charles C. Bates has been designated as the deputy chief, as well as chief scientist of the Coast Guard.

Located at U.S. Coast Guard headquarters, 1300 E St., N.W., Washington, D.C., the new office is organized into three divisions: the Applied Sciences Division, the Applied Technology Division, and the Human Resources Division.



# DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of December 1968.

## DEFENSE SUPPLY AGENCY

2—**Burley Processing,** Burley, Idaho. $1,741,286. 451,584 cases of sliced, uncooked dehydrated potatoes. Defense Personnel Support Center, Philadelphia, Pa. DSA 137-69-C-CB59.

4—**Lester D. Lawson & Co.,** Long Beach, Calif. $1,699,891. 57,120 cases of sundries packs for ration supplements. Defense Personnel Support Center, Philadelphia, Pa. DSA 134-69-C-0439.

5—**Ojus Industries,** Miami, Fla. $1,729,354. 200,004 coils of concertina barbed wire. Defense Construction Supply Center, Columbus, Ohio. DSA 700-69-C-4066.

—**Columbian Steel Tank Co.,** Kansas City, Mo. $1,970,048. 105 liquid storage tanks. Defense Construction Supply Center, Columbus, Ohio. DSA 700-69-C-0946.

11—**Gulf Oil Corp.,** Houston, Tex. $5,580,921. 23,802,000 gallons of gasoline; 2,932,500 gallons of diesel fuel and 53,455,100 gallons of fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-0727.

13—**E. I. DuPont DeNemours & Co.,** Wilmington, Del. $2,649,390. 65,626,200 lbs. of amonium nitrate. Defense General Supply Center, Richmond, Va. DSA 400-69-C-3318.

—**Phillips Scientific Corp.,** Bartlesville, Okla. $2,094,998. 56,698,200 lbs. of amonium nitrate. Defense General Supply Center, Richmond, Va. DSA 400-69C-3322.

16—**Pembroke, Inc.,** Egg Harbor City, N.J. $1,551,788. 71,610 men's blue serge overcoats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-60-C-1037.

20—**GAF Corp.,** New York, N.Y. $1,089,189. 19,900 rolls of photographic aerial film. Defense General Supply Center, Richmond, Va. DSA 400-69-C-3452.

27—**M.L.W. Corp.,** Bapamon, Puerto Rico, $2,450,000. 1,000,000 pairs of men's wind-resistant sateen ripstop poplin trousers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1107.

## DEPARTMENT OF THE ARMY

2—**Chamberlain Mfg Corp.,** Elmhurst, Ill. $1,853,747 (contract modification). Metal parts for 4.2-inch projectiles. Waterloo, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0036.

—**Philco-Ford Corp.,** Newport Beach, Calif. $1,380,000. Classified countermeasure program. Army Missile Command, Huntsville, Ala. DA AHO1-69-C-0878.

3—**Jones & Laughlin Steel Corp.,** Pittsburgh, Pa. $2,470,121 Electric steel welded pipe. Engineer Dist., San Francisco, Calif. DA CA09-69-C-0020.

—**Cadillac Gage Co.,** Warren, Mich. $1,410,000. Light armored cars. Tank Automotive Command, Warren, Mich. DA AE07-69-C-0744.

—**Hughes Tool Co.,** Culver City, Calif. $1,194,330. OH-6A helicopter hub assemblies. Aviation Materiel Command, St. Louis, Mo. DA 23-204-AMC-03697.

4—**Institute for Defense Analyses,** Arlington, Va. $5,300,000 (contract modification). Basic and applied research; $3,300,000 (contract modification). Evaluation and operational analyses. Defense Supply Service, Washington, D.C. DA HC15-67-0011 DA HC15-67-C-0012.

—**Baldwin Electronics,** Inc., Little Rock, Ark. $3,101,760. Loading, assembling and packing 2.75-inch rocket motors. Camden Ark. Picatinny Arsenal, Dover, N.J. DA AA21-69-C-0317.

—**John R. Hollingsworth** Co., Phoenixville, Pa. $2,971,026 (contract increment). Generator sets Mobility quipment Command, St. Louis, Mo. DA AK01-68-C-1572.

—**Pace Corp.,** Memphis, Tenn. $1,193,550. Ground-to-air parachute flares. Memphis and Camden, Ark. Picatinny Arsenal, Dover, N.J. DA AA21-69-C-0284.

—**General Electric,** Burlington, Vt. $1,009,281. Spare parts for the 20mm vulcan gun. Army Procurement Agency New York, N.Y. DA AG25-69-C-0347

5—**Bell Aerospace Corp.,** Fort Worth, Tex. $2,425,000. HH-1K search and rescue helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1911.

—**General Motors,** Cleveland, Ohio. $1,000,000. Interim phase of advanced production engineering on the XM-70 combat tank. Cleveland and Milwaukee, Wis. Tank Automotive Command, Warren, Mich. DA AE07-69-C-0770.

6—**Caterpillar Tractor Co.,** Peoria, Ill. $2,396,817. Tractors and repair parts. Army Missile Command, Huntsville. Ala. DA AK01-69-C-4706.

—**Greenhut Construction** Co., Pensacola, Fla. $1,357,756. Construction of officers quarters at Columbus AFB, Miss. Engineer Dist., Mobile, Ala. DA CA01-69-C-0002.

—**Western Electric,** New York, N.Y. $1,189,350 (contract modification). Modification and rehabilitation of a government-owned facility at Burlington, N.C., in support of the Sentinel production program. Sentinel System Command, Huntsville, Ala. DA HC60-68-C-0026.

—**General Motors,** Pontiac, Mich. $3,425,349. Trucks with repair parts and technical manuals. Mobility Equipment Command, St. Louis, Mo. DA AK01-69-C-4945.

—**Iowa Mfg.** Co., Cedar Rapids, Iowa. $2,091,292. Crushing and screening plants for use on highway restoration. Mobility Equipment Command, St. Louis, Mo. DA AK01-69-C-4660.

—**International Harvester** Co., Melrose Park, Ill. $1,500,000. Loaders. Libertyville, Ill. Mobility Equipment Command, St. Louis, Mo. DA AK01-69-C-4674.

9—AVCO Corp., Stratford, Conn. $2,232,810 (contract modification). T55-L-11 turbine engines for CH-47C helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1853.

—**Western Electric,** New York, N.Y. $3,242,291 (contract modification). Sentinel training aids and engineering. Greensboro, N.C.; Bedford, Mass.; Syracuse, N.Y.; and Santa Monica, Calif. Sentinel Systems Command, Huntsville, Ala. DA HC60-69-C-0010.

—**Kennedy Van Saun Corp.,** Danville, Pa. $3,858,140. Metal parts for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0257.

—**Philco-Ford Corp.,** Philadelphia, Pa. $4,156,115 (contract modification). Installation and testing of a classified equipment for a world-wide communication system. Electronics Command, Fort Monmouth, N.J. DA AB08-67-C-0153.

10—**Kaiser Steel Corp.,** El Monte, Calif. $3,274,000. Boxes for small caliber ammunition. Culver City, Calif. Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0186.

11—**Pace Corp.,** Memphis, Tenn. $1,917,163. White Star parachute signals. Picatinny Arsenal, Dover, N.J. DA AA21-69-C-0327.

12—**FMC Corp.,** San Jose, Calif. $1,350,000. M113A1 full-tracked personnel carriers. Tank Automotive Command, Warren, Mich. DA AE07-69-C-0762.

—**Gould Marathon Battery Co.,** St. Paul, Minn. $2,014,000. Dry batteries. Electronics Command, Philadelphia, Pa. DA AB05-69-C-3223.

—**Union Carbide Corp.,** New York, N.Y. $1,836,240. Dry batteries. Electronics Command, Philadelphia, Pa. DA AB05-69-C-3224.

—**Radio Engineering Labs,** Long Island City, N.Y. $2,200,000 (contract modification). Ten shelters for use with the Integrated Wide Band Communications System. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0424.

13—**Honeywell, Inc.,** Tampa, Fla. $2,000,000 (contract modification). Classified electronic repair parts. Electronics Command Fort Monmouth, N.J. (contract number is classified).

—**Hercules, Inc.,** Wilmington, Del. $1,350,000. 1,000,000 lbs. of M9 propellant for 81mm mortars. Kenvil, N.J. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0280.

—**Mason & Hanger, Silas Mason Co.,** New York, N.Y. $5,934,750 (contract modification). Support services and for loading, assembling and packing ammunition and components. Burlington, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0468.

—**Goodyear Tire & Rubber, Co.,** Akron, Ohio. $1,131,488. Pneumatic tires for 2½ and 5-ton trucks. Gadsden, Ala. Tank Automotive Command, Warren, Mich. DA AE07-69-C-1273.

—**Lockheed Aircraft,** Sunnyvale, Calif. $2,177,150 (contract modification). A classified quantity of YO-3A aircraft. Aviation Materiel Command, St. Louis, Mo. DA AJ01-69-C-0059.

—Chrysler Corp., Warren, Mich. $11,065,017 (contract modification). M60A1 combat tanks. Army Weapons Command, Rock Island, Ill. DA AF03-69-C-0018.

—**Charles N. Bohrer,** Atlanta, Ga. $1,670,633. Construction of a water treatment plant at Fort Gordon, Ga. Engineer Dist., Savannah, Ga. DA CA21-69-C-0028.

—**Martin-Marietta Corp.,** Orlando, Fla. $1,739,075. Special test program for the Pershing weapon system. Army Missile Command, Huntsville, Ala. DA AH01-69-C-0863.

—**Hughes Aircraft,** Culver City, Calif. $2,578,500 (contract modification). Laser range finders for M60-A1E2 tanks. Frankford Arsenal, Philadelphia, Pa. DA AA25-69-C-0153.

16—**Lear Siegler, Inc.,** Anaheim, Calif. $7,805,375. Metal parts for 105mm artillery shell fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-1069.

—**Gibbs Mfg. & Research Corp.,** Janesville, Wis. $1,985,400. Metal parts for 2.75-inch rocket fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-69-C-0104.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company — Value — Material or Work to be Performed—Location of Work Performed (if other than company plant) — Contracting Agency—Contract Number.

17—**Chrysler Motors**, Warren, Mich. $5,535,101. Cargo trucks and ambulances. Tank Automotive Command, Warren, Mich. DA AA07–69–C–0771.

18—**Honeywell, Inc.**, Tampa, Fla. $15,500,000. Classified electronic equipment. Electronics Command, Fort Monmouth, N.J.

—**General Motors**, Oak Creek, Wis. $2,500,000. Integration of night sights into an armored vehicle. Mobility Equipment Command, Fort Belvoir, Va. DA AK02–69–C–0156.

—**Hughes Aircraft**, Fullerton, Calif. $1,172,995 (contract modification). A 12-month engineering program for the AN/TSQ-51 air defense control and coordination system. Army Missile Command, Huntsville, Ala. DA 01–021–AMC–15606.

19—**Harrington & Richardson, Inc.**, Worcester, Mass. $11,335,842. M16A1 rifles and for inspection and test equipment. Army Weapons Command, Rock Island, Ill. DA AF–03–68–C–0045.

—**General Motors**, Ypsilanti, Mich. $9,459,600. M16A1 rifles and for inspection and test equipment. Army Weapons Command, Rock Island, Ill. DA AF–03–68–C–0048.

—**American Machine & Foundry Co.**, York, Pa. $13,980,000. Metal parts for 105mm high explosive projectiles. $1,438,636. Provision of facilities for the manufacture of metal parts for 105mm high explosives. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0267. DA AA09–69–C–0270.

20—**Raytheon Co.**, Andover, Mass. $1,083,507. Repair of radar sets for the HAWK missile system. Fort Bliss, Tex. Army Missile Command, Huntsville, Ala. DA AH01–68–A–0037.

—**International Terminal Operating Co.**, New York, N.Y. $13,976,526. Stevedoring and related terminal services for a two-year period at the Military Ocean Terminal, Bayonne, N.J. Military Traffic Management & Terminal Service, Brooklyn, N.Y. DA HC21–69–D–0089.

—**Harvey Aluminum Co.**, Torrance, Calif. $7,089,397 (contract modification). Loading, assembling and packaging ammunition and components, and for maintenance and support services at the Army Ammunition Plant, Milan, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11–173–AMC–00520 (A).

—**Kaiser Jeep Corp.**, Toledo, Ohio. $7,332,237 (contract modification). Five-ton trucks (M39 series). South Bend, Ind. General Purpose Vehicle Project Manager, Army Missile Plant, Warren, Mich. DA AE06–69–C–0012.

—**Mack Trucks**. Allentown, Pa. $4,651,606 (contract modification). Diesel engines for 5-ton trucks. Hagerstown, Md. General Purpose Vehicle Project Manager, Army Missile Plant, Warren, Mich. DA AE06–68–C–0010.

—**Boeing Co.**, Morton, Pa. $1,244,583. Transmission assemblies for CH–47 helicopters. Aviation Systems Command, St. Louis, Mo. DA AJ01–68–A–0005.

—**Bell Helicopter Co.**, Fort Worth, Tex. $1,007,400. Modification kits for the XM35 weapon systems for the AH–1G helicopter. $1,753,095. Blade assemblies for UH–1 helicopters. Aviation Systems Command, St. Louis, Mo. DA ADJ01–68–A–0022. DA AJ01–68–A–0022.

—**Mack Trucks**, Allentown, Pa. $1,626,562. Tractor and dump trucks, and spare part kits. Allentown, Pa. and Woodbridge, N.J. Tank Automotive Command, Warren, Mich.

23—**Olin Mathieson Chemical Corp.**, East Alton, Ill. $2,341,000 and $9,053,070. 60mm (M83A3) and 81mm (M301A2) projectiles. Marion, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0051 and DA AA09–69–C–0086.

—**Bell Helicopter Co.**, Fort Worth, Tex. $9,079,995. Rotary wing blades for UH1 helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ01–68–A–0022.

—**Honeywell, Inc.**, North Hopkins, Minn. $1,951,254. M219E1 fuzes for bomblets. St. Louis Park, Minn. Army Procurement Agency, Chicago, Ill. DA AA09–69–C–0140.

—**Goodyear Tire & Rubber Co.**, Akron, Ohio. $2,217,048. Pneumatic tires for 2½-ton trucks. Gadsden, Ala. and Danville, Va. Tank Automotive Command, Warren, Mich. DA AE08–69–C–1820.

—**B.F. Goodrich Co.**, Akron, Ohio. $1,051,881. Pneumatic tires for 2½-ton trucks. Miami, Okla. Tank Automotive Command, Warren, Mich. DA AE07–69–C–1821.

24—**Raytheon Co.**, Andover, Mass. $2,394,000. Rebuilding of high power illuminators for the Hawk missile system. Roedelheim, Germany. Army Missile Command, Huntsville, Ala. DA 01–021–AMC–14159 (Z).

—**Heckethorn Mfg. Co.**, Dyersburg, Tenn. $1,017,045 (contract modification). Hand grenades. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0127.

—**Philco Ford Corp.**, Philadelphia, Pa. $4,500,000. Classified electronic equipment. Electronics Command, Fort Monmouth, N.J.

—**Bell Helicopter Co.**, Fort Worth, Tex. $5,338,041. Rotary wings for UH–1 helicopters. Aviation Systems Command, St. Louis, Mo. DA AJ01–68–A–0222.

—**LTV Electro-Systems, Inc.**, Huntington, Ind. $8,084,062. Radio sets. Huntington Ind. and Salt Lake City, Utah. Electronics Command, Philadelphia, Pa. DA AB05–69–C–1320.

—**Emerson Electric Co.**, St. Louis, Mo. $1,736,250. XM–28 helicopter armament subsystems. Army Weapons Command Rock Island, Ill. DA AF03–68–C–0025.

26—**Western Electric**, New York, N.Y. $13,273,907 (contract modification). Production of training aid devices for Sentinel. Burlington, N.C. Sentinel System Command, Huntsville, Ala. DA HC60–68–C–0017.

—**General Time Corp.**, LaSalle, Ill. $9,911,714. Metal parts for multi-purpose fuzes. Peru, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0310.

—**Harvey Aluminum**. Torrance, Calif. $3,113,415. 40mm cartridge cases. Army Procurement Agency, Pasadena, Calif. DA AA09–69–C–0143.

—**Zenith Radio Corp.**, Chicago, Ill. $2,482,022. 66mm rocket fuzes. Army Procurement Agency, Chicago, Ill. DA AA09–69–C–0039.

—**Hayes-Albion Corp.**, Albion, Mich. $1,508,580. Metal parts for 2.75-inch rocket warheads. Hillsdale, Mich. Army Procurement Agency, Cincinnati, Ohio. DA AA09–69–C–0128.

—**General Motors**, Indianapolis, Ind. $1,313,850. Transmission components for the M109 tracked combat vehicle. Tank Automotive Command, Warren, Mich. DA AE07–68–C–0836.

27—**Honeywell, Inc.**, Tampa, Fla. $7,806,387. Multiplexers and related spare parts kits. Electronics Command, Philadelphia, Pa. DA AB05–67–C–1225.

—**R.C.A.**, Burlington, Mass. $6,127,070. Land combat support system sets. Army Missile Command, Huntsville, Ala. DA AH01–69–C–0775.

—**General Electric**. Burlington, Vt. $3,990,000. M61A1 20mm guns, GAU–4/A 20mm guns and SUU–23/A pods. Procurement Agency, New York, N.Y. DA AG25–68–C–0864.

—**Flinchbaugh Products**, Red Lion, Pa. $2,790,996. Metal parts for 152mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0317.

—**Airport Machining Corp.**, Martin, Tenn. $1,687,125. 60mm projectiles. Union City, Tenn. Army Procurement Agency, Cincinnati, Ohio. DA AA09–69–C–0064.

—**General Electric**, Burlington, Vt. $1,616,826. Line items of repair parts for the 20mm XM35 armament sub-system. Army Weapons Command, Rock Island, Ill. DA AF03–69–C–0036.

—**Radiation, Inc.**, Melbourne, Fla. $1,500,000. Classified electronic equipment. Electronics Command, Fort Monmouth, N.J.

—**FMC Corp.**, Santa Clara, Calif. $1,301,272. Metal parts for 4.2-inch projectiles. Anniston, Ala. Army Procurement Agency, Chicago, Ill. DA AG11–69–C–0369.

—**Bell Aerospace Corp.**, Fort Worth, Tex. $1,249,041. Hydraulic servo cylinders for AH–1G helicopters. Hurst, Tex. Aviation Systems Command, St. Louis, Mo. DA AJ01–68–A–0022.

—**Otto J. Eickhof & Sons, Inc.**, Crookston, Minn. $1,016,007. Additions and alterations to a medical center and a dental clinic at Grand Forks AFB, N.D. Engineer Dist., Omaha, Neb. DA CA45–69–C–0037.

—**General Motors**, Detroit, Mich. $2,936,392. The development phase of a total package procurement award for design, development, advanced production engineering, confirmatory test, and production of 1¼-ton utility trucks and ambulances. Warren, Mich. and Baltimore, Md. Tank Automotive Command, Warren, Mich. DA AE07–69–C–0071.

30—**Hercules, Inc.**, Wilmington, Del. $19,589,203 (contract modification). Manufacture of propellants and explosives. Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11–173–AMC–00037 (A).

—**Raytheon Co.**, Lexington, Mass. $4,206,800. Metal parts for 750-lb. bomb tail fuzes. $3,785,652. Metal parts or 750-lb. bomb nose fuzes. Work on both contracts will be done in Bristol, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0073. DA AA09–69–C–0070.

—**Thiokol Chemical Corp.**, Bristol, Pa. $4,082,642 (contract modification). Load, assemble and pack ammunition and ammunition components. Marshall, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11–173–AMC–200(A).

—**Honeywell, Inc.**, North Hopkins, Minn. $3,582,675. M219 and M219E1 bomblet fuzes. $1,330,400. Metal parts for bomb nose fuzes. Work on both contracts will be done in New Brighton, Minn. Army Procurement Agency, Chicago, Ill. DA AA09–69–C–0138. DA AA09–69–C–0106.

—**Consolidated Box Co.**, Tampa, Fla. $1,786,795. 4.2-inch mortar containers. Army Procurement Agency, Chicago, Ill. DA AG11–69–C–0399.

—**Chimera Corp.**, Kearney, Neb. $2,431,620. Generator sets. Mobility Equipment Command, St. Louis, Mo. DA AK01–69–C–4537.

—**Stevens Mfg. Co.**, Ebensburg, Pa. $2,330,532. 12-ton semi-trailers. Tank Automotive Command, Warren, Mich. DA AE07–69–C–1443.

—**Alcan Aluminum Corp.**, Riverside, Calif. $2,303,694. 66mm rocket motors. Army Procurement Agency, Pasadena, Calif. DA AA09–69–C–0107.

—**Goodyear Tire & Rubber Co.**, Akron, Ohio. $2,217,048 (contract modification). Pneumatic tires. Gadsden, Ala. and Danville, Va. Tank Automotive Command, Warren, Mich. DA AE07–69–C–1820.

—**Bell Aerospace Corp.**, Fort Worth, Tex. $1,936,342. Gear box assemblies for UH–1 helicopters. Hurst, Tex. Aviation Systems Command, St. Louis, Mo. DA AJ01–68–A–0022.

—**Bauer Ordnance Co.**, Warren, Mich. $1,900,537. Hydraulic rammer assemblies for M109 self-propelled howitzers and concurrent repair parts. Army Weapons Command, Rock Island, Ill. DA AF03–69–C–0044.

—**AVCO Corp.**, Stratford, Conn. $1,389,022. Repair parts for T–53 turbine helicopter engines. Aviation Systems Command, St. Louis, Mo. AF 41–608–67–A–3234.

31—**Eastman Kodak Co.**, Kingsport, Tenn. $24,699,272 (contract modification). Production of explosives and for support services. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11–173–AMC–00035(A).

—**Sperry Rand Corp.**, New York, N.Y. $14,592,908 (contract modification). Production of ammunition and components. Shreveport, La. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11–173–AMC–00080(A).

—**National Gypsum Co.**, Buffalo, N.Y. $12,581,522 (contract modification). Production of ammunition and related components. Parsons, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11–173–AMC–00095 (A).

—**Medico Industries**, Wilkes Barre, Pa. $4,012,800. Metal parts for 2.75-inch rocket warheads. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0319.

—**Northrop Corp.**, Anaheim, Calif. $3,435,000. Metal parts for 2.75-inch rocket warheads. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0308.

—**Lehigh, Inc.**, Easton, Pa. $3,249,760. Metal parts for 2.75-inch rocket warheads. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0300.

—**Appalachian Power Co.**, Radford, Va. $3,225,000 (contract modification). Electrical power to support production requirments at the Army Ammunition Plant, Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11–173–AMC–00134(A).

—**Chamberlain Mfg. Corp.**, Elmhurst, Ill. $2,355,280. Metal parts for 105mm projectiles. Waterloo, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0320.

—**General Time Corp.**, LaSalle, Ill. $1,662,120. Metal parts for M423 rocket fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–69–C–0105.

—**Western Electric**, New York, N.Y. $32,052,245. Design, development, fabrication, installation and testing of the common apperture multifunction array radar system. Burlington and Winston Salem, N.C., Wippany, N.J. and Wayland, Mass. Sentinel System Command. Redstone Arsenal, Ala. DA HC60–69–C–0040.

—**Western Electric, New York,** N.Y. $10,871,000 (contract modification). Additional research and development on the Sentinel Missile System. Morris Plains, N.J., Huntington Beach, Calif., Bedford, Mass. and Syracuse, N.Y. Sentinel System Command, Redstone Arsenal, Ala. DA 30–069–AMC–00333 (Y).

—**Western Electric**, New York, N.Y. $5,009,728 (contract modification). Additional hardware for the Sentinel Perimeter Acquisition Radar. Burlington, N.C., Whippany, N.J., and Syracuse, N.Y. Sentinel System Command, Redstone Arsenal, Ala. DA 30–069–AMC–00333 (Y).

—**Hazeltine Corp.**, Little Neck, N.Y. $3,506,000. Ground interrogator sets which elicit responses from airborne transponders. Greenlawn, N.Y. Electronics Command, Philadelphia, Pa. DA AB05–69–C–0404.

—**Raytheon Co.**, Norwood, Mass. $3,068,398. Multiplexers and spare parts kits. North Dighton, Mass. Electronics Command, Philadelphia, Pa. DA AB05–69–C–1012.

—**Phalo Corp.**, Shrewsbury, Mass. $1,115,629. Cable and adapter assemblies. Laredo, Tex. Electronics Command, Philadelphia, Pa. DA AB05–69–C–1020.

—**Western Electric.** New York, N.Y. $6,445,150 (contract modification). FY 69 Nike Hercules missiles system engineering services. Burlington, N.C., Syracuse, N.Y. and Santa Monica, Calif. Army Missile Command, Huntsville, Ala. DA AH01–68–C–0405.

—**Amron-Orlando Corp.**, Orlando, Fla. $5,677,412. Metal parts for 40mm cartridge fuzes. Army Procurement Agency, Chicago, Ill. DA AA09–69–C–0047.

—**Chrysler Corp.**, Detroit, Mich. $5,365,896 (contract modification). Settlement of engineer orders on M60A1E2 combat tanks, combat engineering vehicles and M60A1 AVLB tanks with combat chassis. Army Weapons Command, Rock Island, Ill. DA AF03–67–C–0009.

—**Texas Instruments, Inc.**, Dallas, Tex. $3,500,000. Classified electronics equipment. Electronics Command, Fort Monmouth, N.J.

—**Chrysler Corp.**, Detroit, Mich. $2,377,144 (contract modification). Settlement of engineering orders on M60A1E1 turret systems and concurrent repair parts. Army Weapons Command, Rock Island, Ill. DA 11–199–AMC–00662 (W).

—**Action Mfg. Co.**, Philadelphia, Pa. $1,951,196 (contract modification). Metal parts for 750-lb. bomb tail fuzes. Army Procurement Agency, Chicago, Ill. DA AA09–69–C–0075.

—**Cargill Detroit Corp.**, Clawson, Mich. $1,796,312. White phosphorus production equipment. Engineer Dist., Fort Worth, Tex. DA CA63–69–C–0079.

—**Norris Industries**, Los Angeles, Calif. $1,705,037 (contract modification). 152mm projectiles. Army Procurement Agency, Pasadena, Calif. DA AG07–68–C–1257.

—**University of Wisconsin**, Madison, Wis. $1,420,000 (contract modification). Operation of the Mathematics Research Center, Madison, Wis. Army Research Office, Durham, N.C. DA 31–124–ARO–D–0462.

—**ITT Corp.**, Eaton, Pa. $1,408,645. Repair parts for image intensifier assemblies. Roanoke, Va. Electronics Command, Fort Monmouth, N.J. DA AB07–68–C–0115.

—**Andrews & Parrish Co.**, Richmond, Va. $1,244,900. Construction of active Army support facilities at A.P. Hill Military Reservation, Va. Engineer Dist., Norfolk, Va. DA CA65–69–C–0028.

—**General Motors**, Detroit, Mich. $1,085,425. Diesel engines for 1¼-ton trucks. Tank Automotive Command, Warren, Mich. DA AE07–68–C–2597.

## DEPARTMENT OF THE NAVY

2—**Harvey Industries**, Glendale, Calif. $1,914,045. Zuni rocket launchers. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–69–C–0161.

3—**Magnavox Co.**, Fort Wayne, Ind. $31,916,849 (contract modification). Airborne ASW systems. Naval Air Systems Command. N00019–68–C–0497.

—**Pace Corp.**, Memphis, Tenn. $1,033,560. Detonating fuses for 5-inch, 54 cal. guns. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–69–C–0171.

—**AVCO Corp.**, Stratford, Conn. $1,547,060. Constant speed drives for generators. Naval Air Systems Command. N00019–69–C–0082.

—**General Dynamics**, Groton, Conn. $22,000,000. Materials and equipment for construction of a nuclear attack submarine. Naval Ships Systems Command. N00024–67–C–0345.

4—**Grumman Aircraft Engineering Corp.**, Bethpage, N.Y. $10,420,000 (contract modification). Long lead time effort for FY 1969 procurement of A–6A aircraft. Naval Air Systems Command. NOw 66–0058.

—**United Aircraft**, Stratford, Conn. $7,896,130. HH–3F helicopters for the Coast Guard. Naval Air Systems Command. N00024–69–C–0261.

—**Westinghouse Electric**, Pittsburgh, Pa. $4,657,400. Nuclear reactor compartment components. Naval Ship Systems Command. N00024–69–C–5101.

—**General Dynamics**, Pomona, Calif. $3,081,790. Weapon systems modernization of seven guided missile frigates. Naval Ship Systems Command. N00024–69–C–0241.

5—**Dixie Mfg. Co.**, Baltimore, Md. $5,797,768. Procurement of two deep dive systems to be installed aboard two new submarine rescue ships. Naval Ship Systems Command. N00024–69–C–0261.

—**Auchter Co.**, Jacksonville, Fla. $3,298,000. Construction of a patrol aircraft support facility. Jacksonville, Fla. Southeast Div., Naval Facilities Engineering command, Charleston, S.C. N62467–67–C–0473.

6—**Todd Shipyards**, New York, N.Y. $13,950,000. Construction of an oceanographic research ship. Seattle, Wash. Naval Ship Systems Command. N00024-69C–0256.

—**University of Washington**, Seattle, Wash. $2,365,500. Research and development in the field of underwater ordnance. Naval Ordnance Systems Command. NOw 65–0207–d.

—**Bendix Corp.**, Mishawaka, Ind. $1,220,000. Engineering and development program on TALOS RIM–8 series and TALOS ARM missiles and associated production and tactical test equipment. Naval Ordnance Systems Command. N00017–68–C–4302.

—**Chromalloy American Corp.**, Edwardsville, Ill. $1,024,435. Electric primers used in the 5-inch, 38-cal. gun ammunition loading program. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–69–C–0144.

9—Raytheon Co., Lowell, Mass. $7,350,847. Guidance and control groups for Sidewinder missiles for the Navy and Chaparral missiles for the Army. Naval Air Systems Command. N00019-69–C–0200.

—**Alsco, Inc.**, St. Louis, Mo. $5,042,549 (contract modification). Rocket launchers. Naval Air Systems Command. N00019–68–C–0562.

—**Norris Industries**, Los Angeles, Calif. $4,905,938. MK 81, MOD 1, bomb bodies for 250-lb. bombs. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–69–C–0188.

—**Cosmodyne Corp.**, Torrance, Calif. $2,489,500. Ammi flash distillation water barges. Naval Facilities Engineering Command. N62473–69–C–0037.

—**Hartman Systems Co.**, Huntington Station, N.Y. $2,171,953. Refurbishing and modifying navigational computer display sets. Naval Air Systems Command. N00019–69–C–0160.

—**Fairbanks Morse, Inc.**, Beloit, Wis. $2,008,246. Diesel engines, associated special tools, and engineering services. Naval Ship Systems Command. N00024–69–C–5259.

—**Lasko Metal Products**, Hughestown, Pa. $1,914,045. Zuni rocket launchers. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–69–C–0167.

—**Curtiss Wright Corp.**, Wood-Ridge, N.J. $1,846,610. Modification kits for J65 engines used on A–4 aircraft. Aviation Supply Office, Philadelphia, Pa. F41608–69–A–0057–GB01.

—**General Precision Systems, Inc.** Little Falls, N.J. $1,038,717. Converter and mounting components for the AN/AVA–1 digital data system. Aviation Supply Office, Philadelphia, Pa. N00383–69–C–0063.

10—**LTV Aerospace Corp.**, Dallas, Tex. $7,500,000 (contact modification). Long lead time effort in support of FY 1970 procurement of A–7D aircraft. $7,000,000 (contract modification). Long lead time effort in support of FY 1970 procurement of A–7E aircraft. Naval Air Systems Command. N00019–67–C–0143. N00019–68–C–0075.

—**Sperry Rand Corp.**, St. Paul, Minn. $9-841,500. Avionics computers for P–3C aircraft. $3,319,081 (contract modification). Avionics computers for P–3C aircraft. Naval Air Systems Command. N00019–69–C–0295. N00019–68–C–0255.

—**Fairchild Hiller Corp.**, Syosset, N.Y. $4,687,496. MK 344, MOD O and MK 376, MOD O, electric bomb fuzes. Naval Air Systems Command. N00019–69–C–0337.

—**Lockheed Aircraft**, Marietta, Ga. $3,500,000. Research and development on a classified project. Naval Air Systems Command. N00019–69–C–0309.

—**Honeywell, Inc.**, Seattle, Wash. $1,395,310. MK 48, MOD O torpedo program management; test planning; data taking, reduction and analysis; full time test vessel service and research and development support services. Naval Ordnance Systems Command. N00017–69–C–1210.

—**Schenuit Industries**, Baltimore, Md. $1,008,897. Pneumatic tires for A4 aircraft. Aviation Supply Office, Philadelphia, Pa. N00383–69–C–2518.

11—**General Electric**, West Lynn, Mass. $2,917,419. Retrofit kits for T58–GE–8 engines. Aviation Supply Office, Philadelphia, Pa. F34601–68–A–2114–GBGY.

12—**General Electric**, Utica, N.Y. $3,180,968. Guidance and control groups for Chaparral missiles. Naval Air Systems Command. N00019–69–C–0199.

—**DeLaval Turbine, Inc.**, Trenton, N.J. $1,976,631. Steam turbine generators including associated engineering services, technical data and reports. Naval Ship Systems Command. N00024–69–C–5254.

13—**A. G. Schoonmaker Co., Inc.**, Sausalito, Calif. $3,039,234. Production of generators. Naval Construction Battalion Center, Davisville, R.I. N62578–68–C–0126.

—**Hercules, Inc.**, Wilmington, Del. $1,958,891. Composition D–2 wax Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–69–C–0186.

16—**North American Rockwell Corp.**, McGregor, Tex. $4,911,553. Rocket motors for Sparrow and Shrike guided missiles. Naval Air Systems Command. N00019–69–C–0215.

—**United Aircraft**, East Hartford, Conn. $2,250,000 (contract modification). Increase the limitation of authorization for design, fabrication and testing of the JTF10A–32C engine. Naval Air Systems Command. N00019–69–C–0120.

—**Sperry Rand**, St. Paul, Minn. $1,606,600. Computers, switchboards, motor generators and consoles for shipboard use. $1,618,009. Computers and associated components. Work on both contracts will be done at St. Paul, Minn. and Salt Lake City, Utah. Naval Ship Systems Command. N00024–69–C–1134. N00024–69–C–1149.

17—**Lockheed Aircraft**, Burbank, Calif. $89,562,000. P–3C aircraft. Naval Air Systems Command. N00019–69–C–0237.

—**Westinghouse Electric**, Pittsburgh, Pa. $10,000,000. Nuclear reactor compartment components. Naval Ship Systems Command. N00024-67-C-5058.

—**United Aircraft**, Stratford, Conn. $2,-000,000 (contract modification). Long lead time effort for HH-3E helicopters. Naval Air Systems Command. N00019-67-C-0664.

—**Simplex Wire & Cable Co.**, Newington, N.H. $1,500,000. Branch cable for use in oceanographic research. Naval Electronic Systems Command. N00039-69-C-3524.

18—**General Electric**, Schenectady, N.Y. $24,-550,000. Nuclear reactor compartment components. Naval Ship Systems Command. N00024-67-C-5321.

—**Sperry Rand Corp.**, Long Island City, N.Y. $1,800,000. Production of computers. Naval Ordnance Systems Command. N00017-69-C-2304.

—**United Tractor & Equipment Co.**, Rockville, Md. $1,678,372. Aircraft towing tractors. Chesterton, Ind. Naval Air Engineering Center, Philadelphia, Pa. N000156-69-C-1094.

—**Raytheon Co.**, Bedford, Mass. $1,365,054 (contract modification). Incremental funding for Sparrow III missiles. Naval Air Systems Command. N00019-67-C-0019.

—**North American Rockwell Corp.**, Columbus, Ohio. $1,144,000. Lower skins, upper skins and wing skins for RA5C aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-69-A-5202-0114.

19—**Hughes Aircraft**, Fullerton, Calif. $5,-526,325. Navy tactical data system units. Naval Ship Systems Command. N00024-69-C-1111.

—**Raytheon Co.**, Portsmouth, R.I. $3,235,110. Calibration and restoration of sonar equipment. Naval Ship Systems Command. N00024-69-C-1131.

20—**Akwa-Downey Construction Co.**, Milwaukee, Wis. $2,549,972. Construction of an electronic weapons precision facility at the Naval Shipyard, Long Beach, Calif. Naval Facilities Engineering Command. N62473-68-C-0042.

—**Westinghouse Electric**, Pittsburgh, Pa. $1,995,500. Design and and production of nuclear propulsion components. Naval Ship Systems Command. N00024-69-C-5101.

—**Southwest Welding & Mfg. Co.**, Alhambra, Calif. $1,850,732. Construction of 52 steel hulled mechanized landing craft. Naval Ship Systems Command. N00024-69-C-0251.

—**Bond Lumber & Millwork Corp.**, Bridge-Water, Va. $1,087,333. Weapons trailers for munitions handling. Naval Air Engineering Center, Philadelphia, Pa. N00156-69-C-1107.

23—**United Aircraft**, Stratford, Conn. $87,-040,000 (contract modification). CH-53D helicopters. Naval Air Systems Command. N00019-68-C-0471.

—**United Aircraft Corp.**, Startford, Conn. $2,300,000 (contact modification). Long lead time effort and material for HH-53 helicopters. Naval Air Systems Command. N00019-67-C-0401.

—**General Electric**, Utica, N.Y. $8,055,527. Data processing systems for P-3C aircraft. Naval Air Systems Command. N00019-69-C-0270.

—**Collins Radio Co.**, Cedar Rapids, Iowa. $2,726,986. Classified electronic countermeasure equipment. Naval Air Systems Command. N00019-69-C-0084.

—**Osrud Machine Works, Inc.**, Niles, Ill. $1-531,351. Numerically controlled machine that profiles and contours propellers. Navy Purchasing Office, Washington, D.C. N00600-69-C-0436.

24—**General Dynamics**, Pomona, Calif. $4,-300,000 (contract modification). AGM-78A Standard ARM weapon systems. Naval Air Systems Command. N00019-67-C-0399.

—**FMC Corp.**, San Jose, Calif. $2,301,244. Engineering support for Navy assault amphibious vehicles. Naval Air Systems Command. N00024-69-C-2062.

—**Sperry Rand Corp.**, Charlottesville, Va. $1,602,997. Periscopes, repair parts and associated technical data. Naval Ship Systems Command. N00024-69-C-5061.

—**General Electric**, Binghamton, N.Y. $1,-268,500. Automatic flight control systems. Naval Air Systems Command. N00019-69-C-0077.

27—**Raytheon Co.**, North Dighton, Mass. $9,-012,257. Production of AN/SPG-51C radar sets and related equipment. Naval Ordnance Systems Command. N00017-69-C-2317.

—**Del E. Webb Corp.**, Honolulu, Hawaii. $16,744,000. Construction of housing units at Hickam AFB, Hawaii; the Naval Complex, Oahu, Hawaii, and the Pacific Missile Range, Kauai, Hawaii. Mid-Pacific Div., Naval Facilities Engineering Command, Honolulu, Hawaii. N62471-69-B-0278.

—**B-E-C-K Christenson Raber-Keif and Associates**, Seattle, Wash. $1,494,719. Construction of a hanger and a transmitter and electronics repair facility at the Naval Arctic Research Laboratory, Barrow, Alaska. Northwest Div., Naval Facilities Engineering Command, Seattle, Wash. N62476-69-C-0076.

—**Healy Tibbitts Construction Co.**, Long Beach, Calif. $1,193,460. Construction of utilities for Pier Six at the Naval Shipyard, Long Beach, Calif. Southwest Div., Naval Facilitiest Engineering Command, San Diego, Calif. N62473-68-C-0103.

—**Palmetto Construction Co.**, Charleston, S.C. $1,076,994. Construction of a mine warfare school addition, Naval School of Mine Warfare, Charleston, S.C. Southeast Div., Naval Facilities Engineering Command, Charleston, S.C. N62467-68-C-0181.

30—**Southern Stevedoring Corp.**, Norfolk, Va. $2,748,591. Stevedoring services for the Naval Supply Center, Norfolk, Va. Naval Supply Center, Norfolk, Va. N00189-69-D-0238.

—**Vitro Corp. of America**, Silver Spring, Md. $1,375,000. Engineering services to implement a configuration management control program on the USS Guitarro (SS-363) ASW combat system. Naval Ordnance Systems Command. N00017-69-C-1415.

31—**General Electric**, Schenectady, N.Y. $24,-550,000. Design and furnishing of nuclear propulsion components. Naval Ship Systems Command. N00024-67-C-5321.

—**Tractor, Inc.**, Austin, Tex. $1,650,000. Integrated logistic support investigations and studies for submarine radar. Naval Ship Systems Command. N00024-69-C-1051.

—**Raytheon Co.**, Lowell, Mass. $1,696,760. Modification kits for Sparrow III missiles. Oxnard, Calif. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-67-A-0006.

## DEPARTMENT OF THE AIR FORCE

2—**Lockheed Missiles & Space Co.**, Sunnyvale, Calif. $4,400,000. Launch support services for the Western Test Range, Vandenburg AFB, Calif. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. FO4701-68-C-0005.

3—**Aerojet-General**, Sacramento, Calif. $2,-414,000. Pre-production effort to support the FY 1970 requirements for Stage II motors for Minuteman III. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. FO4701-69-C-0138.

—**Del E. Webb Corp.**, Phoenix, Ariz. $3,-320,777. Construction of 172 family housing units at George AFB, Calif: Procurement Div., George AFB, Calif. FO4609-69-C-0061.

—**J. J. Cook Construction, Inc.**, Oklahoma City, Okla. $3,157,710. Construction of 162 family housing units at Tinker AFB, Okla. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34650-69-C-0218.

—**Continental Aviation & Engineering Corp.**, Detroit, Mich. $2,115,270. Production of J69 aircraft engines. Toledo, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0263.

4—**Sunstrand Corp.**, Rockford, Ill. $6,459,700. Production of constant speed drives and gear boxes for aircraft. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-A-2298.

—**F. D. Rich Co.**, Stamford, Conn. $4,968,-000. Construction of 300 family housing units at Craig AFB, Ala. Base Procurement Office, Craig, AFB, Ala. F016022-69-C-0087.

5—**Adventure Line Mfg. Co.**, Parson, Kan. $3,332,600. Production of bomb components. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F42600-69—C-2401.

—**Victor Compometer Corp.**, Rogers, Ark. $2,272,792. Production of bomb components. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F42600-69-C-2395.

—**Bendix Corp.**, South Bend, Ind. $1,103,943. Production of wheels and main landing gear applicable to KC-135 aircraft. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F34601-67-A-2849.

6—**Fairchild Camera & Instrument Corp.**, Syosset, N.Y. $1,380,000. Production of airborne camera systems. Aeronautical Systems Div., (AFSC), Wright Patterson AFB, Ohio. F33657-69-C-0472.

—**G&S Construction, Inc.**, Rapid City, S.D. $1,321,897. Labor, equipment and materiels necessary to move 200 relocatable houses from Glasgow AFB, Montana, to Mountain Home AFB, Idaho. Procurement Div., Mountain Home AFB, Idaho. F10603-69-C-0087.

9—**Hallicrafters Co.**, Chicago, Ill. $2,485,328. Modification kits and associated items of the ALT-28 airborne electronics system. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F34601-68-A-2915-RJ08.

—**General Electric**, Binghamton, N.Y. $1,-500,000. Production of components for the AN/ASG-26 computing optical sight system. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0569.

10—**Westinghouse Electric**, Baltimore, Md. $9,-000,000. Production of airborne countermeasure equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-69-C-0440.

11—**Aerojet General**, Sacremento, Calif. $8,-403,901 (contract increment). Research, development and production of Stage III motors for Minuteman missiles. Space & Missile Systems Organization, (AFSC), Norton AFB, Calif. F04694-67-C-0004.

12—**Modulux, Inc.**, Newark, Calif. $1,084,575. Production of modular relocatable buildings. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603-69-C-1645.

13—**TRW, Inc.**, Redondo Beach, Calif. $6,-500,000. Development support for the Minuteman weapon system (for period ending June 30, 1969); $10,415,304. Non-development support of Minuteman weapon system (for period ending June 30, 1969). Work on both contracts to be done at Norton AFB, Calif. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0163. F04701-68-C-0164.

17—**United Aircraft of Canada**, Longuequil, Quebec, Canada. $1,647,926. R4360 aircraft engine spare parts. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. N383-93300A.

18—**Honeywell, Inc.**, Minneapolis, Minn. $4,-359,300. Modification of the MB-5 automatic flight control system for F-101 aircraft. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-C-4711.

—**Boeing Co.**, Seattle, Wash. $1,900,000. Minuteman modernization program. Cheyenne, Wyo. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-69-A-0142.

—**Curtiss-Wright Corp.**, Wood-Ridge, N.J. $1,358,085. Production of spare parts for aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-69-A0057.

20—**Goodyear Aerospace Corp.**, Litchfield Park, Ariz. $1,936,418. Production of spare parts for the AN/APQ-102 radar system. Akron, Ohio and Litchfield, Ariz. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F34601-68-A-3143.

—**Maxson Electronics Corp.**, Great River, N.Y. $5,382,725. Production of fuse assemblies for bombs. Old Forge, Pa. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F34601-68-A-2701.

—**Southwest Airmotive Co.**, Dallas, Tex. $2,034,215. Overhaul and modification of J-33 engines. Oklahoma Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-69-C-0096.

23—**TRW, Inc.**, Redondo Beach, $3,400,000. Minuteman operational targeting verification and validation program. Norton AFB, Calif. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-69-C-0121.

—**General Electric**, West Lynn, Mass. $16,-686,000. J85-GE-5G/13/17/17A Turbo-jet engines. Aeronautical Systems Div., (AFSC), Wright-Patterson, AFB, Ohio. F38601-69-C-0065.

—**Goodyear Aerospace Corp.**, Akron, Ohio. $1,377,977. Large pallets for loading and unloading air cargo. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603–69–C–1946.

—**General Motors**, Indianapolis, Ind. $9,246,236. Production of T56–A–14 turboprop engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–0706.

—**Lake McDonald, Inc.**, Vidalia, Ga. $5,531,100. Construction of a 300-unit adddition to the family housing area at Shaw AFB, S.C. Procurement Div., Shaw AFB, S.C. F38601–69–C–0065.

26—**Superior Steel Ball Co.**, New Britain, Conn. $2,330,477. Production of BLU 26 bomblet components. Washington, Ind. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F42600–69–C–2533.

27—**Continental Aviation & Engineering Corp.**, Detroit, Mich. $2,600,000. Production of J100 jet engines. Toledo, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–69–C–0607.

—**Singer-General Precision, Inc.**, Binghamton, N.Y. $1,400,000. Mission simulator and support items for F–111 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–1239.

—**Sydney Construction Co.**, Brookline, Mass. $1,961,500. Construction of family housing units at L. G. Hanscom Field, Mass. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. F19650–69–C–0421.

—**Dallas Airmotive, Inc.**, Dallas, Tex. $1,737,536. Overhaul of R2800 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608–69–D–0672.

30—**Litton Systems**, Woodland Hills, Calif. $9,153,917. Production of avionics subsystems for F–4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–094.

—**Cornell Aeronautical Lab**, Buffalo, N.Y. $2,297,097. Analysis and evauation of effectiveness of penetration aids. Aeronautica Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33615–68–C–1319.

—**M.I.T.**, Cambridge, Mass. $2,422,000. Basic research concerning the properties of matter in intense magnetic fieds. Air Force Office of Scientific Research. F44620–67–C–0047.

—**I.B.M.**, Gaithersburg, Md. $1,600,000. Work on a large aperture seismic array experimental signal processing system. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. F19628–68–C–0400.

—**Raytheon Co.**, Waltham, Mass. $1,525,165. Production of electron tubes. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603–68–A–0327.

—**Bendix Corp.**, South Bend, Ind. $1,041,000. Overhaul and modification of engine fuel controls. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601–69–D–0731.

31—**Lockheed Aircraft Service Co.**, Jamaica, N.Y. $1,754,002. Maintenance and modification of special air mission aircraft for FY 69. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601–68–C–4334.

—**General Electric**, Cincinnati, Ohio. $2,500,000. Engineering effort and services for J79–GE–10/–15/–17 aircraft engines for CY 1969. Evendale, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–69–C–0434.

—**Canadian Commercial Corp.**, Ottawa, Ontario, Canada. $2,323,608. Weapons release control systems for F–4D/E aircraft. Aeronautial Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–69–C–0634.

—**AAI Corp.**, Cockeysville, Md. $1,031,088. Modification of fault detection testers for F–4C/D weapons control systems. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–0908.

## OFF-SHORE PROCUREMENT

20—**Canadian Commercial Corp.**, Ottawa, Ontario, Canada. $1,257,500. Production of pressure-temperature test sets and spare parts. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608–69–C–7306.

## Distributing the Risk

*(Continued from page 10)*

factors could work to the detriment of system quality and ultimate performance, a risk which has not developed in the C–5 but should not be tolerated.

While I believe that we cannot afford to relinquish the advantages of total package, I believe that we can, and must, find a way to modify our present method of implementing the total package. Thus the Air Force and industry would retain the advantages of production commitments obtained in competition. Modified procedures would, at the same time, avoid unnecessary design and development risk or exposure of the contractor to unreasonable financial risk.

I believe that we can improve the existing imbalance that apparently exists in the financial/technical risk tradeoff matrix. One way would be to raise significantly the fixed-price incentive contract ceiling and to use a shallow dollar share formula. Another way would be to return to the outright use of cost reimbursement type contract for development. Under this approach, the development through completion of Category II testing may be procured under a cost-type contract, while the production items would be procured on a fixed-type contract. I hasten to add that this approach would not merely be a commonplace combining of a cost plus incentive fee with a fixed price incentive fee contract, as we now use them.

I hope we can bridge the gap between the development contract and the production contract. I think the performance requirement, terms and conditions, and pricing methods can be established and negotiated under competition. For example, the first production run could be small, using a fixed price incentive contract with a high ceiling and steep share lines. Production Run B would be for a larger number of items, with the target adjusted on the basis of Run A experience, etc.

We may be able to use the design and performance achievements (made during development), for determining the successive formula production provisions.

My legal and procurement advisors foresee problems in assuring that costs, normally associated with production contracts, would not find their way into expenses incurred under the cost-type contract. They also see problems in assuring that non-recurring costs for redesign, resulting from development and testing problems, would not inflate the cost baseline for successive formula negotiations. My advisors believe I would be as vulnerable (under this approach) as poor old St. Peter. They may be right.

We have organized a group to seek ways to reduce the contractor's cost risks for design and development, while maintaining a firm production commitment, secured under a competitive environment. I an hopeful that proper safeguards can be established.

### We Need Your Help

I am aware that I have discussed some things which are subjects of some emotion between the Government and contractors, and sometimes even within the Government itself. Differences of opinion will not go away in an area as vital as risk. However, additional experience in this area will tend to clean up many differences. The close Air Force/industry relationship has weathered successfully many changes since the days of the Wright Brothers, and I'm sure it will in this case.

In the past, industry has been helpful in reviewing and commenting on contracting procedurs. I chalienge you to assist us in finding ways to reduce the design and technical risk, and to balance the scales of financial risk distribution in this case.

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## Production Contract Awarded for New Jet Fuel Starter

A small gas turbine to be used as a starter for aircraft jet engines has been developed by the Aeronautical Systems Division of the Air Force Systems Command. The development has opened up a new family of starters which may be used on many Defense Department aircraft. Called the Jet Fuel Starter, the new device is more economical, lasts longer and requires less maintenance than other starting systems. It requires no ground support equipment.

An initial $9.5 million production contract for the starter has been let to AiResearch Division of Garrett Corp., Phoenix, Ariz., to support the A–7D aircraft. The system provides enough power to start engines in F–4, F–101, F–111, F–106, KC–135 and B–52 aircraft. Retrofit on several aircraft is under consideration.

The Jet Fuel Starter is completely self-contained. It uses only 1.5 pints of on-board aircraft fuel to start an engine. It weighs about 75 pounds, measures 19 inches long by 11 inches in diameter. It develops about 90 horsepower.

The new starter is of modular construction. Any or all of three modules can be replaced independently, reducing overhaul costs by an estimated 50 percent. The three modules are the gas generator, power turbine and accessory module.

Presently, aircraft are dependent upon either a starting cartridge, which is good for only one start at a cost of $12, or on a costly ground pneumatic power cart. The new starting system, by eliminating need for cartridges and ground power carts, will reduce world-wide logistics and will provide reliable, self-contained, quick start capability.

In addition to the technological advance of the system, the cost reduction to the Air Force is almost as significant. The new system has resulted in a validated cost saving of $3.7 million. The starter will be procured as Government Furnished Aeronautical Equipment.

Engineers who developed the starter over the past six years predict there may be many applications for general aviation. Studies are currently under way to determine future applications.

## Army Seeks Modular Construction Equipment

It is called FAMECE for Family of Military Engineer Construction Equipment.

As seen in a study of combat engineer battalions in the mid-1970s, now being conducted by the Engineer Agency, U.S. Army Combat Developments Command, FAMECE would comprise a single rubber-tired power pod and a wide variety of work attachments to replace individually powered pieces of equipment.

Without using special tools, the operator could attach the power pod to special wheeled attachments in less than 30 minutes, making such items as a non-tracked bulldozer, front loader, grader, scraper, etc.

FAMECE will be designed to move over the road at convoy speeds, to work on steep inclines, and to be light enough to be lifted by helicopters of the 1970s or to be para-dropped. Initial plans call for FAMECE to be used in forward combat areas, but future studies will evaluate the equipment for operational, economic and productive feasibility in other areas and conditions.

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